COMMERCIAL FISHERIES Review

DIV. OF FISHES

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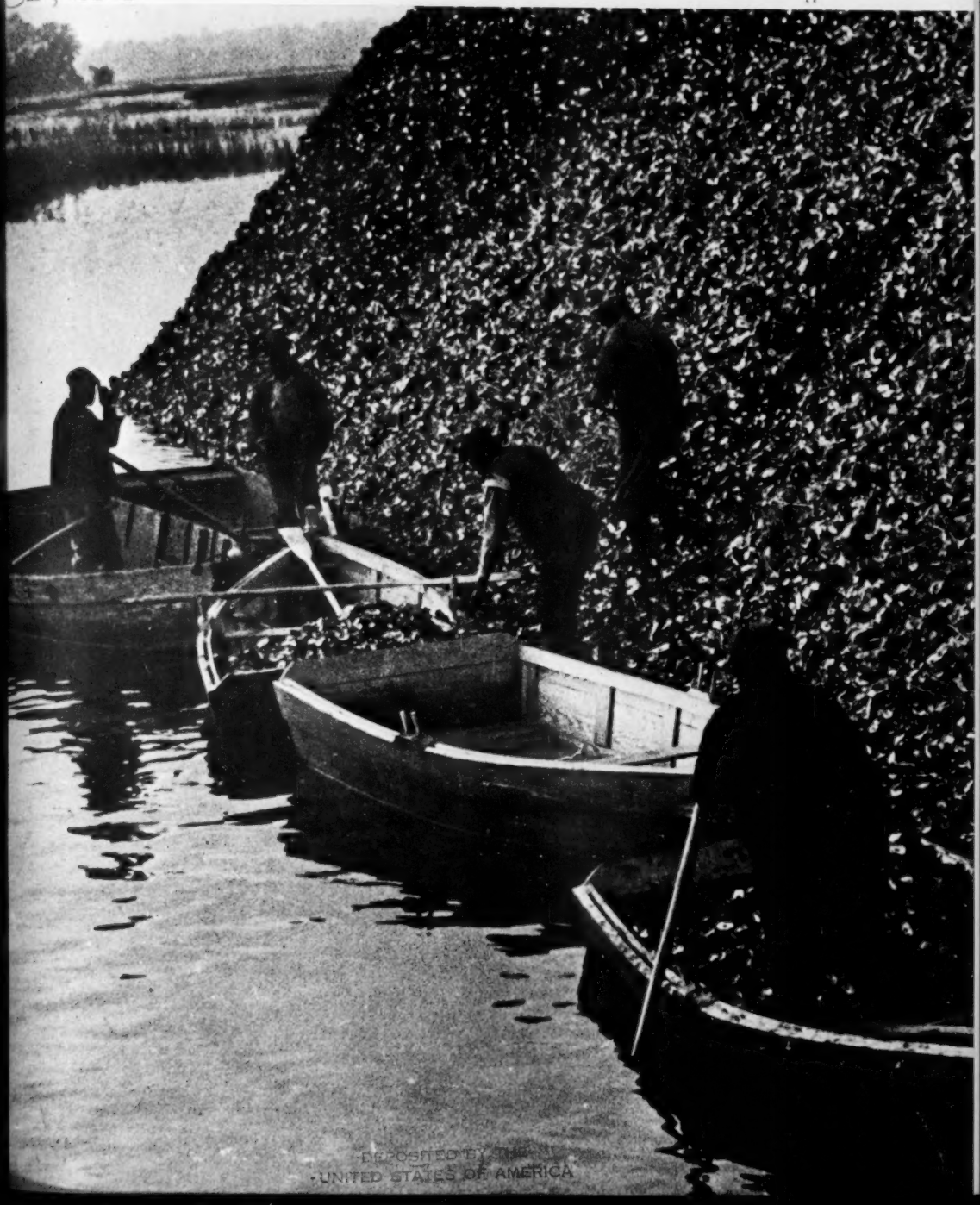

COVER: Loading oyster shells for planting as cultch.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

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The Bureau of Sport Fisheries and Wildlife
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Throughout this book, the initials BCF stand
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CONTENTS

Transferring king crab from weighing bucket to processing-plant cart. (BCF-Alaska photo: J. M. Olson)

THE U.S. FOOD SITUATION

The average American ate a record amount of food in 1969 and paid over 5% more for it. This year there likely will be slightly more food supplies per person, but retail prices will rise again--perhaps $3\frac{1}{2}$ to 4%. It will reflect continued strong demand. This is reported by the U.S. Department of Agriculture.

Food consumption per person in 1969 was a record 106% of 1957-59 average. It was slightly higher than 1968. The increase came primarily in chicken and turkey, vegetable oils, fresh and processed fruits, and processed potato products. Consumption of red meat per person was slightly less--more beef but less veal, lamb, and pork. Consumption of eggs, milk, and most manufactured dairy products declined. Cheese consumption increased.

Fishery-Product Consumption Steady

Although per-capita consumption of fishery products has remained constant, total consumption of fresh and frozen food-fish products has increased faster than domestic landings. The gap has been filled by imports of food-fish products.

Retail Prices Up

Despite continued high level of food availability, retail prices rose sharply in 1969. The year's average was 5.2% above 1968; prices in December 1969 were 7.2% above a year earlier.

Restaurant food prices moved up steadily throughout 1969. Red meats and eggs led in price advances for store-bought food. Most other food-store items also rose, but prices of fats and oils leveled, and prices of fresh fruit declined.

1970 Predictions

Per-capita food supplies are expected to gain slightly in 1970. Consumption of poultry and processed fruits likely will rise substantially; that of eggs and fish probably will rise moderately. Beef production and consumption will be up, but veal and lamb again will be down. Pork production will be down until later in 1970, then increase, so total red-meat per-capita consumption may be about 1969 level.

1970 Fish Consumption

In 1970, civilians will eat about 1,230 million pounds of fishery products (edible weight). One quarter will come from groundfish: such as cod, haddock, hake, Boston bluefish (pollock), and ocean perch; about 60% of this will be imported. Landings of flounders, cod, ocean perch, and Boston bluefish are expected to rise above a year ago, while haddock landings will drop to a record low. The decline in haddock landings may more than offset any gains in other groundfish.

NORTH ATLANTIC SHRIMP INDUSTRY EDGES SOUTH

On the U.S. Atlantic Coast, the northern shrimp fishery appears to be edging southward, reports BCF. The northern shrimp used to be harvested almost exclusively within 50 miles of Portland, Maine, and marketed as "Maine shrimp."

BCF has promoted frozen Maine shrimp at international food fairs. Introduced in London in 1966, it has been well received in France, Germany, Italy, Sweden, and the Netherlands. About 50% of Maine's shrimp production for the 1968-69 season was exported to Western Europe, mostly to Sweden.

Enter Non-Maine Fishermen

Biologists do not know where these deep-water shrimp mature, but they move shoreward to spawn and are caught then. Maine's commercial fishermen have harvested the small pink shrimp as a winter crop--from September or October into April or May.

However, BCF exploratory fishing has shown the shrimp within reach of other coastal states; also, that traditional shrimping season can be extended through summer. As a result, vessels from Massachusetts and New Hampshire moved into the fishery in 1969.

In 1969, Maine fishermen caught about 24.5 million pounds worth around $3 million; Massachusetts landed 4.5 million pounds worth about $500,000, and New Hampshire about 100,000 pounds valued at $12,000.

A new processing plant capable of handling up to 200,000 pounds of shrimp a day is being built on Gloucester (Mass.) State Fish Pier.

Northern & 4 Florida Species

As the northern shrimp fishery expands, BCF marketing specialists speculate that the shrimp may be marketed more widely under a more general name. In the Gloucester area, it is "just shrimp" because it is the only commercial shrimp species there.

In Florida, the picture is somewhat different. There, fishermen land 4 different species--the white shrimp, a somewhat larger brown shrimp, the southern pink (not the same species as the northern shrimp), and royal reds.

Despite this formidable competition, the delicate flavor of the northern shrimp, marketed frozen as a novelty, has won it considerable popularity among Florida gourmets.

Availability Fluctuated Sharply

Northern shrimp are too small and too delicate to be processed by conventional methods. Until the advent of special equipment and techniques, the shrimp either were peeled by hand or sold whole (unpeeled). Besides processing problems, industry development has been hampered by sharp fluctuations in availability. In the 1930s, the northern shrimp was abundant in the Gulf of Maine. By the 1950s, it had practically disappeared. Then, in the late 1950s, it became abundant again.

Mysteries About Shrimp's Environment

Little is known about environmental factors that control the young shrimp's chances of survival to adulthood. Biologists believe the life span is about 4 years. During the last year of life, the shrimp, which begins its adult life as a male, changes to female and moves in toward the shore to spawn.

INTERIOR DEPARTMENT INSPECTED VAST AMOUNT OF FISH IN 1969

During 1969, the inspection service of the U.S. Department of the Interior (USDI) inspected or graded over 328 million pounds (edible-weight basis) of fish and fishery products. About one million pounds of the total were rejected for noncompliance with USDI Grade Standards or product specifications.

The 1969 amount inspected was about 28.5% of the volume processed in the U.S. each year--and 12% of U.S. annual consumption.

GOOD DEMAND FOR PUGET SOUND PACIFIC HAKE

The demand for Puget Sound hake is good this year. Two factors have helped to stimulate it: 1) the formula for the Oregon moist pellet has been changed. Now hake and hake meal can be used in place of other ingredients; and 2) the increase in world price of fishmeal.

Peruvian fishmeal, for example, rose from $172 per ton (f.o.b. New York and Gulf ports) in September 1969 to $204 per ton in December 1969.

Fishermen are receiving $15 to $20 per ton for hake, compared to $12 to $20 last season.

The Fishery

The seasonal fishery begins in September or October and extends through May or June. The catch for the 1969-70 season during September through January is 1,000,000 pounds; for the same period last season, it was 1,700,000 pounds. Generally, fishing improves significantly during the season's second half, when hake are more concentrated and available in the area of Port Susan. Last season's catch was 9,000,000 pounds.

NEW DEVICE PROTECTS SALMON AT LOW-HEAD DAMS

A prototype fish-guiding device has been installed in a turbine intake of Ice Harbor Dam (Snake River, Washington). It is a large traveling screen designed to divert salmon fingerlings from the turbine, where many die. After a week's trial, under maximum turbine load conditions, its mechanical operation has been successful. Its efficiency in diverting salmon fingerlings from the turbine will be measured this spring, when their seaward migration starts.

The device is a key part of a bypass system being developed to protect salmon fingerlings of the Upper Snake River in their migrations past seven dams on their way to the sea.

OYSTER STUDIES YIELD IMPORTANT INFORMATION

A Federal-state study of shellfish in Pacific coast bays revealed a relatively high mortality in native oysters and mussels from Yaquina Bay, Oregon. However, the Pacific oyster, more than 99% of the oysters marketed commercially, has not been affected. State fisheries agencies of Oregon, Washington, and California have cooperated with BCF, University of Washington, and the Pacific Coast Oysters Growers Association in investigating causes of oyster mortalities since 1965.

Lab Examination

Experimental planting of native oysters in Yaquina Bay suffered mortality rates from 18 to 30%, or more, per year. Samples of oysters from the trays examined microscopically by biologists at the BCF laboratory in Oxford, Maryland, and at the University of Washington showed a condition that appeared serious enough to cause the oyster deaths. Although similar conditions were observed in mussels taken from Yaquina Bay, it was not found in the Pacific oysters examined from the same area.

No Public Health Threat

No name has been given to the condition present in these native oysters and mussels.

The cause has not yet been identified. Scientists say the disorder could be caused by environmental factors, or by a virus. The Boards of Health in Oregon and Washington reviewed the problem and do not view the native oyster condition as a threat to public health.

In contrast to the high mortality rates of native oysters and mussels, Pacific oyster mortality in Yaquina Bay is the lowest observed on the Pacific coast. In fact, experimental plantings of Pacific oysters in Yaquina Bay, as part of the coastwide mortality study, were used as a "control" for comparison with plantings in other bays, where Pacific oysters have higher death rates.

OYSTER-MEAT QUALITY INDEX REPORTED

A plump, creamy-white oyster meat that generally fills its shell cavity is considered of high quality; a shrunken transparent oyster meat with a high water content that does not fill the shell cavity is considered of low quality. Using this basis, the Virginia Institute of Marine Science has been conducting surveys in the rivers of Virginia to determine the condition of oysters.

Survey's Results

As a result of these surveys, the Institute developed an acceptable measure of quality and relative yield--designated the "Oyster Meats Quality Index." It can be used to compare the actual size of an oyster meat with the space inside the shell cavity. The index's chief value is to provide industry with a useful tool for comparing the potential yield of oysters of the same size, different growing areas, and from one season to the next.

Where To Get Index

The index was reported in the Jan. 1970 issue of the Institute's "Marine Resources Information Bulletin." It may be obtained from the Institute at Gloucester Point, Virginia 23062.

FISHERIES SURVEY OF AMERICAN SAMOA SLATED

The research vessel 'Charles H. Gilbert' of the BCF Biological Laboratory, Honolulu, sailed for American Samoa to conduct the first systematic survey of the area's fishery resources. The Government of American Samoa is cooperating.

The islands are headquarters of a large fishing industry. The two U.S.-owned canneries there are supplied by about 100 vessels from Japan, Korea, and Taiwan. The bulk of the catch is albacore tuna. Much of the product is exported to mainland U.S.

The survey, however, will concern itself with skipjack tuna, for which there is growing demand in the fishing industry.

SCIENTISTS WARN AGAINST ADDING DDT TO ANTI-FOULING PAINT

The Virginia Institute of Marine Science (VIMS) is concerned about continuing reports of oyster-boat owners mixing DDT with copper anti-fouling paint. The mixture is used on boat bottoms to control scurf, borers (worms) and barnacles. This is an extremely dangerous practice "because DDT is one of the most toxic pollutants that can be put in water," VIMS scientists warn. They say its value in protecting boat bottoms has never been proved and it may, in fact, do more harm than good. DDT could change the paint and cause it to flake off--exposing bare wood to infestation.

Shellfish Concentrate DDT

Shellfish, especially oysters, concentrate DDT in their bodies to levels approximately 10,000 times those found in the water. One pound of DDT can contaminate a billion pounds of water. This would be sufficient to load over 100,000 bushels of oysters with enough DDT to justify seizure by health authorities.

Recommends Better Grade of Paint

If the usual 'soft' copper anti-fouling paints are not giving the required protection, VIMS recommends using a better grade of copper, rather than adding materials like DDT. Some

paints now on the market were formulated for tropical areas, where fouling and worm problems are more severe than in Chesapeake Bay. Use of these paints on a properly prepared bottom should provide the necessary protection, without endangering the very seafood products the boats are meant to harvest.

DEALERS INTERESTED IN ALASKAN SEAFOOD

BCF marketing personnel report that seafood dealers in Central and Southwestern States have expressed interest in handling fresh and frozen Alaskan seafood products. Airlines flying between the Western States and Alaska are anxious to fill space. They are willing to discuss special freight rates to instal cold-storage facilities for emergency and temporary holdings. Also, they would facilitate transfer of Alaskan seafoods to eastbound transporters.

Alaskan fishery-product containers assembled on the beach near waters from which products came. (Photo: J. M. Olson)

BCF Coordinates These Interests

BCF personnel are working with Alaskan producers, transporters, and dealers to coordinate their interests in developing markets for these products in Central and Southwestern States.

INTERIOR HONORS BCF SCIENTISTS

Dr. Reuben Lasker, BCF Fishery-Oceanography Center, La Jolla, Calif., has been awarded Interior Department's Meritorious Service Award by Secretary Walter J. Hickel. The award recognizes his outstanding contributions in the physiology of marine organisms, both fish and invertebrates.

Secretary Hickel cited Dr. Lasker's accomplishments in the study of the energy exchange between fishes and their food supply. Dr. Lasker has studied 3 main organisms of the California Current food web, a euphausiid shrimp (a common food organism of pelagic fishes), the Pacific sardine, and the northern anchovy. He discovered that the efficiency of energy transfer of phytoplankton and small zooplankton to euphausiids is about 10% over the animal's life span. Similar studies on adult sardines and anchovy showed the relationship of food needs of these fishes to the energy available in the zooplankton. The studies can be used to predict how much food must be available in the sea to sustain fish populations. He is the author of more than 30 scientific publications in this specialized research.

Dr. Lasker, 40, joined BCF in 1958, after receiving his Ph.D. in Zoology from Stanford University.

Richard A. Barkley of BCF's Biological Laboratory in Honolulu won Interior Department's Meritorious Service Award for his contributions to oceanography.

Secretary Hickel cited Barkley's "Oceanographic Atlas of the Pacific Ocean" and his studies of the interaction of the Kuroshio and Oyashio currents off Japan. The atlas was published by University of Hawaii Press in 1968. It is an analysis of the physics and chemistry of the ocean's upper layers down to about 5,000 feet; it draws upon 50 years of oceanographic observations.

Barkley's investigations of the Kuroshio-Oyashio consisted of a theoretical treatment of what happens when the two streams of water--one warm, one cold--meet. They help explain heretofore-puzzling aspects of the ocean circulation. They offer clues to the physical processes that sustain Japan's immense fisheries.

Barkley, 40, joined the Honolulu Laboratory in 1960 shortly after receiving his Ph. D. in oceanography from the University of Washington.

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'SQUOXIN' IS A SELECTIVE TOXIN FOR SQUAWFISH

A selective fish toxin that will turn squawfish belly-side up--and leave trout, salmon, steelhead, and other desirable species unharmed--is a management tool scientists have long been seeking. Squoxin, a nonchlorinated hydrocarbon that kills the highly predacious squawfish and leaves other fish swimming happily, is a big step in this direction.

Releases of young salmon and trout from fish hatcheries are especially vulnerable to squawfish. As many as 250 young salmon have been found in the digestive tracts of squawfish.

Squoxin Developed

The squawfish-killing chemical was developed by Dr. Craig MacPhee, professor of fisheries at the University of Idaho, after 4 years of research and testing. The search was sponsored by BCF's Columbia Fisheries Program Office.

The selective toxin, Squoxin, acts on the squawfish's nervous system as a vaso-constrictor; it prevents efficient use of oxygen and the proper function of the blood vessels. The chemical is applied to the stream or lake environment--.1 part per million--and kills squawfish, while not harming salmon and trout. The toxin also kills a very few dace and shiners--an indicator that the proper amount of toxin is being metered into stream. It has no effect on aquatic insects or other fish foods, humans, or land animals.

Slow-Working, Short-Lived

Squoxin is a relatively slow-working but short-lived toxin. It becomes ineffective within hours. The first dead squawfish are seen 3 hours after squoxin is applied, and more are dying 24 hours later. Because of squoxin's short life, it must be applied over a long period.

One amazing characteristic of the toxin is that squawfish apparently have no sense of danger, or are aware that they are being killed. With other fish-killing chemicals, such as rotenone, fish of all kinds try desperately to escape with the very first whiff. Squawfish have moved miles downstream to get out of rotenone's effective range.

Field Tests

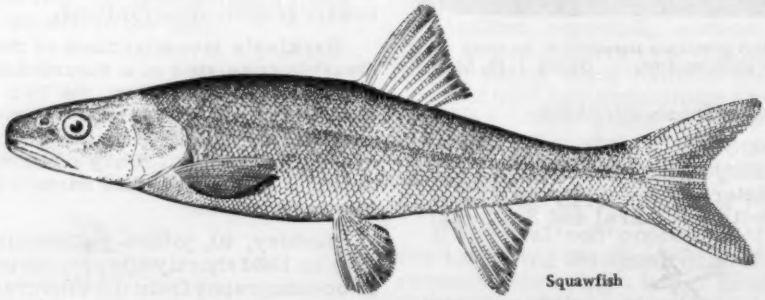
During experimental field tests, squawfish, trout, young salmon, steelhead, and other fish were observed swimming directly below the point where the squoxin was being put into the water. They appeared unaware of the chemical.

The first indication of squawfish distress is an apparent weakening, followed by a slow drift downstream, and then loss of equilibrium. Distress is noted 2 to 3 hours after the start of chemical application. Exact counts of dead squawfish are very difficult to make. But, in one test, it was estimated that about 200,000 squawfish were killed in an 8-mile section of stream.

Squoxin can be an exceptional fishery management tool to help control squawfish, especially in areas heavily populated by squawfish and salmon and trout.

Laboratory experiments on mammals have indicated that this selective chemical is perhaps five times less toxic than table salt when administered to experimental animals on a specific volume-per-unit weight basis.

A patent has been issued to the U.S. Government and the principal investigators by the U.S. Patent Office.



Squawfish

OCEANOGRAPHY

USC STUDIES SANTA BARBARA OIL SPILL EFFECTS

"Keep those (drift) cards coming in, folks," University of Southern California (USC) scientists have asked the public. The scientists are conducting a year-long study of the effects of the Santa Barbara Channel oil spillages.

The drift cards, brightly colored and encased in watertight polyethylene envelopes, are being used to trace ocean currents. They have been released periodically throughout the Santa Barbara Channel from USC's research vessels 'Velero IV' and the 'Golden West.'

Since March 1969, 12,500 drift cards have been released. The final drop was scheduled for Feb. 8-17, 1970.

Public Cooperation Asked

The cards wash up on beaches and other waterfront areas. Finders are asked to discard the plastic envelopes, indicate on the cards where and when they were found, and then mail them (postage-prepaid) to USC.

SURFACE SLICKS HAVE 10,000 MORE PESTICIDE THAN ENCIRCLING WATER

Concentrations of up to 13 parts per billion (ppb) of chlorinated pesticides were measured in natural surface slicks in Biscayne Bay, Florida, by Dr. Eugene F. Corcoran and Dr. Douglas B. Seba of the University of Miami Rosenstiel School of Marine and Atmospheric Sciences. The researchers also found that water surrounding the slicks generally contained less than 1 part per trillion--or less than 1/10,000--of the pesticides found in the slicks.

Dr. Corcoran said: "Natural surface slicks may explain the occurrence of pesticide residues in penguins in the Antarctic, or the disappearance of pelicans from nearly all of the U.S. seacoasts. In Biscayne Bay, for example, we have observed gulls and pelicans diving into surface waters to feed on the dense schools of small fish that feed on plankton concentrated in the slicks. Since these sea birds eat many times their weight in fish, they eventually have more pesticide concentrated in their tissues than the fish did."

"Surface slicks are natural oceanographic phenomena which appear as calm streaks or patches on the otherwise rippled surface of lakes, coastal waters, and open ocean areas," added Dr. Seba. "In our aerial surveys of Biscayne Bay, we have observed slicks varying from a few meters to over 100 meters in width and up to several miles in length. During the summer of 1968, aerial photographs revealed that about 10% of the bay was covered with these slicks"

How Slicks Induced

The slicks may be wind-induced or may occur where two water masses converge. The converging water causes compaction of the film of dissolved organic and inorganic molecules normally found on the surface of biologically productive waters; this provides a tremendous supply of nutrients. Some nutrients are used directly by phytoplankton (microscopic floating plants); others combine into small particles and are used by filter-feeding animals.

Pesticides In Atmospheric Dust

The cycling of pesticides depends not only on food-web interactions, but on interaction between atmosphere, water, silt, and bottom deposits. Dr. Seba and Dr. Joseph M. Prospero found in a study that atmospheric dust collected at Barbados, West Indies, after it had crossed 4,000 miles of open ocean, contained appreciable amounts of chlorinated pesticides. The latter were similar to those found in Biscayne Bay surface slicks. The scientists believe this indicates that Atlantic tropical tradewinds are responsible for transporting significant quantities of pesticides from continents to the open-ocean ecosystem. They also found pesticides in the rainwater of tropical hurricanes.

The research was supported in part by Interior Department's Federal Water Pollution Control Administration, the National Science Foundation, and the Office of Naval Research.

ESSA VESSEL SEEKS EVIDENCE OF PACIFIC SEA-FLOOR SPREADING

U.S. oceanographers are investigating a little-known ocean area in the South Pacific south of Easter Island for evidence of sea-floor spreading. They are aboard the U.S. Coast and Geodetic Survey ship 'Oceanographer,' a "floating laboratory" manned by 95 officers, scientists, and crew.

Their investigation centers on the East Pacific Rise, a 3,000-foot underwater mountain range; the Chile Trench, a deep chasm in the seabed off South America; and the intervening area. The ocean there is about 15,000 feet deep.

Sea-Floor Spreading Theory

The study of sea-floor spreading is based on the theory that the ocean floor moves constantly and carries along the continents. The oceanographers are trying to determine the extent and rate of the spreading.

The oceanographers also are investigating the topography of the sea bottom. Little is known of sea-floor features in this area.

The ship will spend about seven weeks between Papeete, Tahiti, and Valparaiso, Chile.

DISCOVERIES SUPPORT A NEW THEORY OF SEA-FLOOR MOTION

Discoveries that support a new theory of sea-floor motion have been made by scientists in the Deep Sea Drilling Project. Geologist James D. Hays of Columbia University has reported "evidence that the major Pacific Ocean floor plate has moved at varying speed and direction during the past 35 million years." His findings support the theory that "the sea floor is being pulled away from the East Pacific Ridge by the force of gravity." It was believed before that the sea floor was "being pushed and dragged away by the force of convection currents" under it.

His conclusions are based on data gathered on the recently completed ninth leg of the Project, supported by the National Science Foundation. Dr. Hays was chief scientist during the 52-day voyage of the research vessel 'Glomar Challenger' across the equatorial Pacific from Tahiti to Panama.

BOTTLE DRIFTS 7 YEARS FROM GEORGIA TO FLORIDA'S GULF COAST

A bottle tossed into the Atlantic Ocean in June 1962 off Wassaw Island, near Savannah, Ga., by Explorer Scouts was found in the Gulf of Mexico off Ft. Myers Beach, Fla., 830 miles away, in July 1969.

The finder, Don B. Howard, of Ft. Myers, asked oceanographers of Commerce Department's Environmental Science Services Administration (ESSA) what route the bottle could have taken.

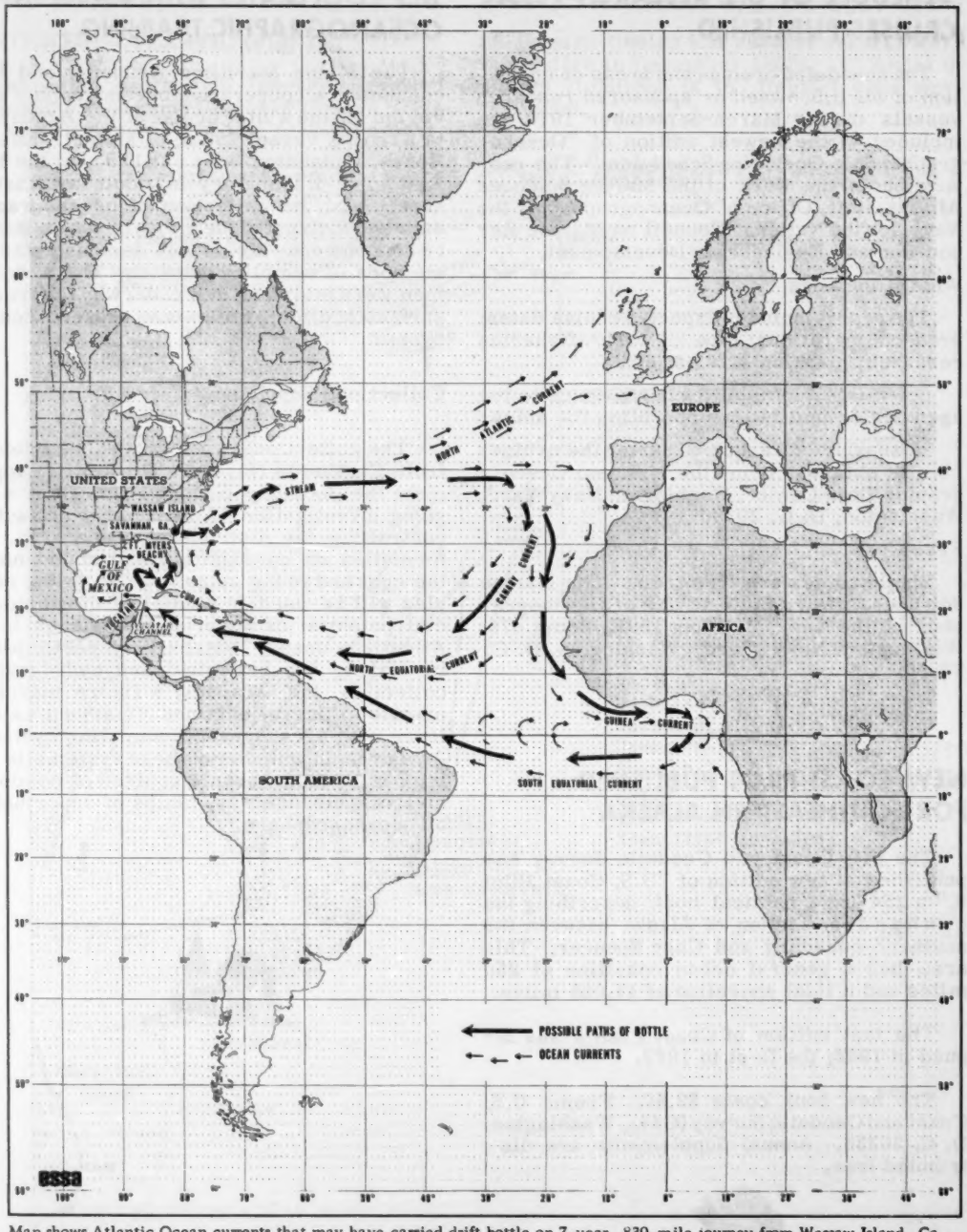
The oceanographers said it was impossible to track the route or estimate the miles traveled. Once the bottle was transported offshore at Savannah, it would have been picked up by the Gulf Stream and carried into the North Atlantic. From there to Ft. Myers Beach, it could have traveled several routes that would have taken it between Cuba and Mexico's Yucatan Peninsula into the Gulf.

The oceanographers said they could suggest probable routes, even though they could not pinpoint the actual route. The time and distance of the drift would vary with seasonal speed and location of ocean currents and local meteorological effects. They outlined these possibilities:

1. When the bottle was picked up by the Gulf Stream, it would have drifted at 2 to 4 miles per hour up the U.S. coast to vicinity of Cape Hatteras, N.C. There, it would move easterly across North Atlantic until caught by Canary Current. This current would carry the bottle southward, down Africa's bulge, and to North Equatorial Current, which would transport it westward across Atlantic into Caribbean. Then the Caribbean Current would transport it to the Yucatan Channel. From there it would pass into Gulf of Mexico and land on Ft. Myers Beach.

2. The bottle could have traveled a somewhat longer route. After drifting down North Africa's west coast, it could have been caught in the Guinea Current and carried south of African bulge to South Equatorial Current. This would have transported bottle across the Caribbean Sea, where it would follow the course outlined above.

In either case, it was considered probable that the bottle lay trapped in the rushes of the Georgia coastal swamps for a long time--until high tides and/or strong offshore winds freed it and caused it to drift far enough from shore to be picked up by the Gulf Stream.



Map shows Atlantic Ocean currents that may have carried drift bottle on 7-year, 830-mile journey from Wassaw Island, Ga., to Ft. Myers Beach, Fla.

SCHEDULE OF U.S. RESEARCH-VESSEL CRUISES PUBLISHED

The scheduled cruises and areas of operation of all U.S. owned or sponsored research vessels during March-September 1970 are included in the newest edition of "Oceanographic Ship Operating Schedules." The publication is the work of the Marine Sciences Affairs staff, Office of Oceanographer of the Navy, for the National Council on Marine Resources and Engineering Development.

What It Includes

The report includes expected cruise dates; area of operations; type of work--fisheries research, plankton studies, etc.

Scientists may apply for berth space to the agencies or institutions operating the ships.

Research data acquired during the cruises can be obtained from the National Oceanographic Data Center, Washington Navy Yard, Washington, D. C. 20390.

Free Copy

Single copies are free from: The Marine Sciences Affairs Staff, Office of Oceanographer of the Navy, Building 159E, Room 476, Washington Navy Yard, Washington, D. C. 20390.

NEW COAST PILOT PUBLISHED FOR SOUTHEASTERN ALASKA

The U.S. Coast and Geodetic Survey has published a new edition of "U.S. Coast Pilot 8," a 254-page nautical book describing the panhandle section of Alaska between the southern boundary and Cape Spencer. This area has a general ocean coastline of 250 miles and a tidal shoreline of 11,085 miles.

The last edition of Coast Pilot 8 was issued in 1962; the first in 1869.

The new book costs $2.50. From: U.S. Coast and Geodetic Survey (C44), Washington, D. C. 20235. Annual Supplements are distributed free.

BCF COOPERATES WITH MAINE IN OCEANOGRAPHIC TRAINING

The Maine Maritime Academy and BCF conducted a cooperative oceanographic survey during the winter cruise of the Academy's training vessel "State of Maine'. Kenneth Honey, a plankton specialist at the BCF Biological Laboratory in Boothbay Harbor, supervised the collection of oceanographic data and instructed the midshipmen in survey techniques. Mr. Honey demonstrated the methods of sampling plankton. The midshipmen were told about new underway expendable surface and deep-water temperature-sensing system.

Collections Supplement Lab's Study

The collections were made periodically from Castine to Nassau. These will supplement the Boothbay Harbor Laboratory's ongoing investigation of oceanographic factors controlling the distribution of plankton. Information on composition and abundance of the eggs and young stages of fish in the samples will be used in studies of the commercial potential of underutilized fishes in the Atlantic's deeper waters. By participating in making the biological and hydrographic collection, the Academy's future merchant marine officers obtained firsthand experience with oceanographic sampling systems. An increasing number of these systems is being put on transoceanic cruises of commercial vessels used as "ships of opportunity" by oceanographers.

FOREIGN FISHING OFF U.S.
JANUARY 1970

NORTHWEST ATLANTIC (Fig. 1)

Favorable weather in January permitted reasonably good surveillance of foreign fleets off New England and Middle Atlantic coasts; 88 foreign fishing and support vessels were sighted (80 in December 1969). No Soviet or Polish violations of 'no fishing' zone were observed.

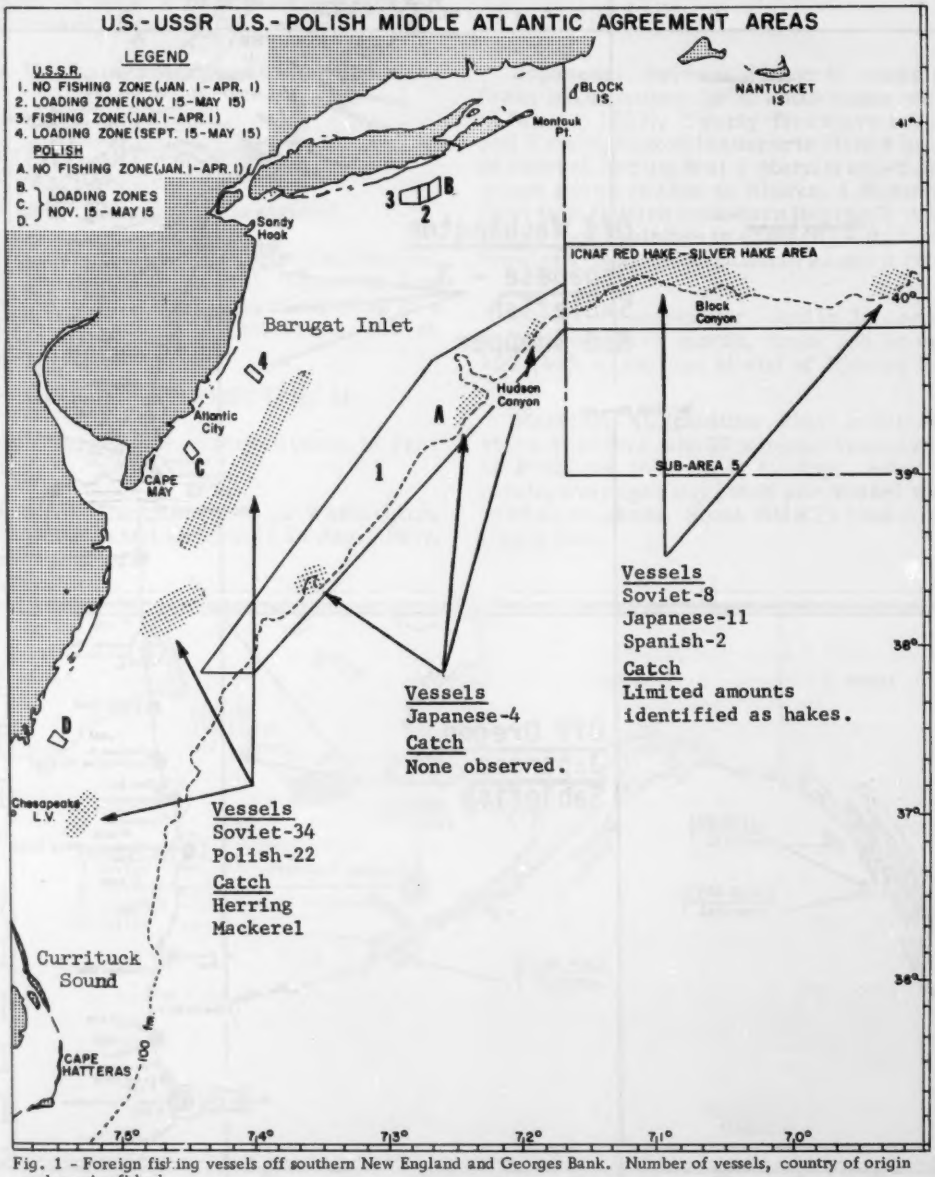


Fig. 1 - Foreign fishing vessels off southern New England and Georges Bank. Number of vessels, country of origin and species fished.

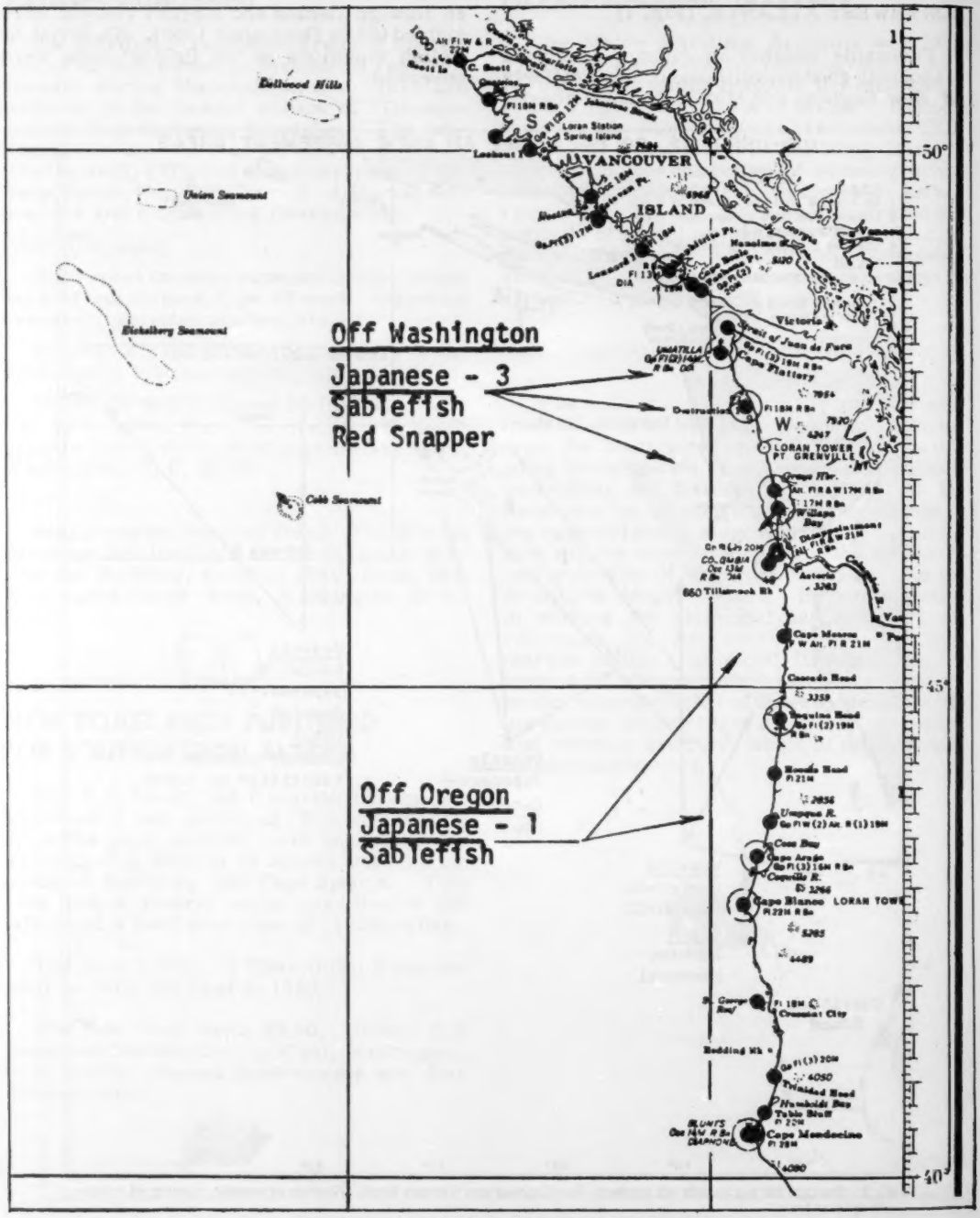


Fig. 2 - Foreign fisheries off U.S. Pacific Northwest.

Soviet: 34 medium side trawlers, 5 factory stern trawlers, 1 factory base ship, 2 refrigerated carriers.

Japanese: 15 freezer stern trawlers.

Polish: 14 large side trawlers, 7 freezer stern trawlers, 1 factory base ship.

East German: 3 stern and 4 side trawlers.

Spain: 2 side trawlers.

OFF CALIFORNIA

No foreign fishing vessels sighted.

On January 26, a BCF scientist boarded the Soviet research vessel 'Ogon' in Los Angeles Harbor. Ogon is participating in a joint U.S.-USSR survey of Pacific hake larvae off Baja California.

OFF PACIFIC NORTHWEST (Fig. 2)

Soviet: No vessels observed (none in Jan. 1969).

Japanese: 3 longliners--2 off Washington, 1 off Washington and Oregon (1 in Jan. 1969).

One longliner off Oregon caught sablefish with an estimated 75% success (percentage of hooks with fish attached). A longliner off Washington had only an estimated 15% success.

OFF ALASKA (Fig. 3)

Japanese: Between 40 and 45 vessels (10 fewer in December 1969; about same number in January 1969). Twenty-five stern trawlers and 2 refrigerated transports fished herring in central Bering Sea; 1 stern trawler fished ocean perch in Gulf of Alaska; 1 factoryship fleet took flatfish in eastern Bering; 2-4 longliners took sablefish in eastern Gulf; 5 stern trawlers fished groundfish in eastern Bering.

Soviet: Vessels increased in January for 3rd consecutive month, from 100 to nearly 190 (40% more than at end of January 1969).

Herring: 45 medium side trawlers, 40 stern trawlers, and 30 support vessels north of Pribilofs in central Bering. After mid-month, average daily catch per vessel was 25 to 30 metric tons. Some BMRTs took over 60 tons a day.

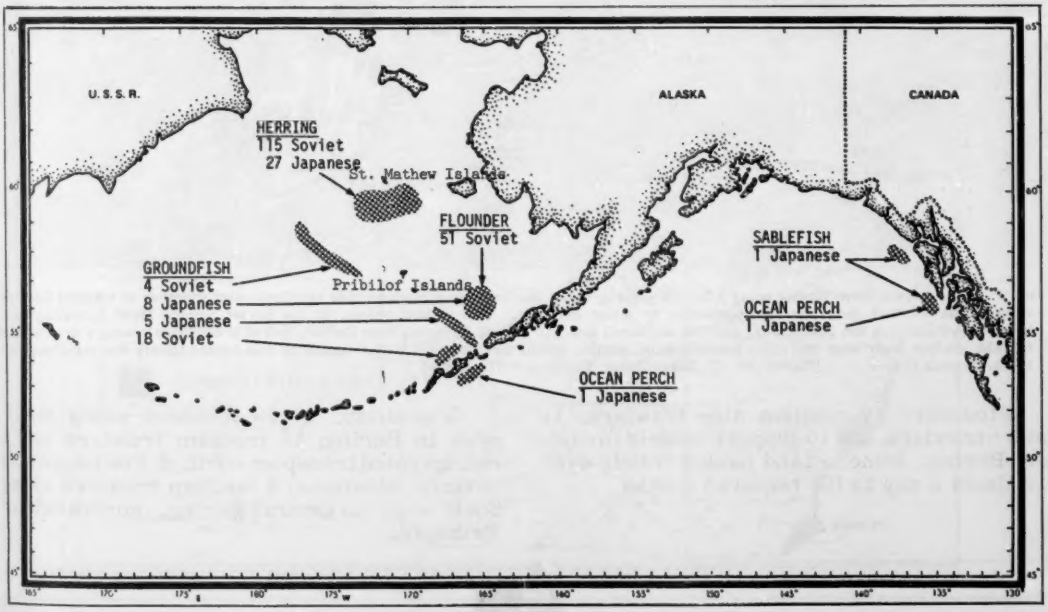


Fig. 3 - Soviet & Japanese fisheries off Alaska, January 1970.

Fig. 4 - Far removed from stormy seas, 7 Soviet vessels--from motherships to medium side trawlers--nest together to transfer fish and cargo while another side trawler approaches to make delivery. The vessels belong to the Soviet herring fleet operating near St. Matthew Island in the Bering Sea, and are anchored some 30 miles, or more, from the ice, but it is common practice for the ships to take shelter from seas and icing conditions by running inside the ice. All Soviet vessels in this winter fishery are reinforced for travel in pack ice. (Photo: M. C. Zahn; Date: December 31, 1969.)

Flounder: 30 medium side trawlers, 11 stern trawlers, and 10 support vessels in eastern Bering. Some set and hauled trawls over 10 times a day to fill required quotas

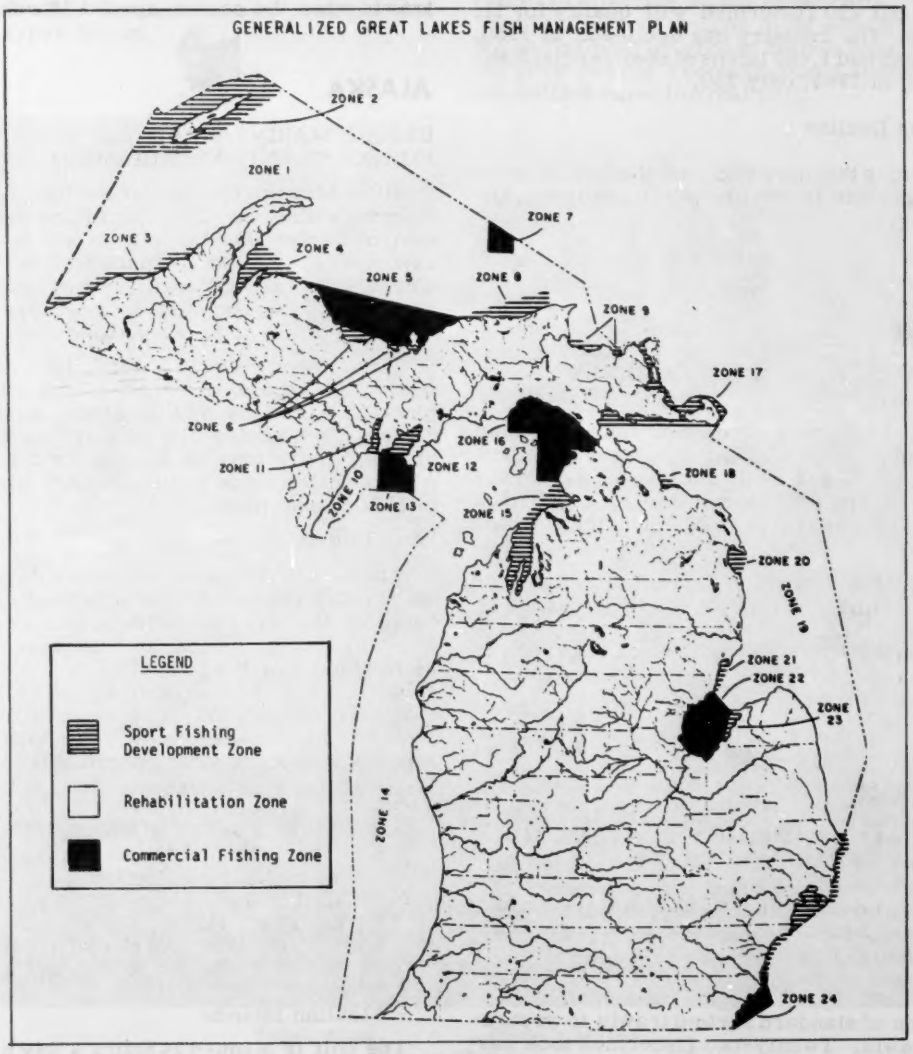
Groundfish: 17-22 trawlers along Shelf edge in Bering; 15 medium trawlers and 1 refrigerated transport north of Fox Islands in eastern Aleutians; 4 medium trawlers along Shelf edge in central Bering, northwest of Pribilofs.

MICHIGAN

GREAT LAKES WATERS ZONED FOR FISHERY MANAGEMENT

In Nov. 1969, the Michigan Natural Resources Commission adopted a zone management plan for its Great Lakes fishery. The plan aims to restore and further develop this resource. It establishes 3 distinct types of use areas in the state's Great Lakes waters for the purpose of managing the fishery in each according to its special problems and needs.

The accompanying map indicates the three types of zones and the sections in the lakes where each will apply. The zones are prescribed for: (1) Sport fishing development--inshore areas with either actual or potential high-quality sport fishery; generally will be



closed to commercial fishing. (2) Rehabilitation--open to sport and commercial fishing; the latter will be closely regulated, particularly the gill nets. (3) Commercial fishing--traditionally productive areas, which will be managed primarily for commercial species.

Number of Fishermen

The plan also regulates number of commercial fishermen. For 1970, it is expected that about 250 fishermen will qualify for licenses. The industry has declined: in 1950, Michigan had 1,460 licensed commercial fishermen; in 1969, only 350.

Species Decline

Species that have declined sharply in lakes Michigan and Huron are perch, walleyes, and herring.

MAINE

1969 PACK OF CANNED SARDINES DECLINED

The 1969 pack of canned Maine sardines has been estimated at 1,018,000 standard cases, worth $12.2 million. It was the smallest pack since 1964 and a drop of 681,302 cases from 1968's pack of 1,699,302 standard cases.

The Maine Sardine Council attributed the decline chiefly to (1) light landings caused by poor weather, (2) failure of late-fall run of fish, and (3) delayed packing at beginning of 1969 caused by large supply of imported and domestic packs.

OREGON

BCF HELPS FISHERMEN CONVERT TO SHRIMP SEPARATOR TRAWL

BCF's Seattle (Wash.) Exploratory Fishing and Gear Research Base and the Oregon State University Extension Service held a 2-day workshop, Jan. 28 and 29, 1970, to demonstrate to Newport, Oregon, fishermen the conversion of standard shrimp trawls to separator trawls. Twenty-two fishermen took part at some time during the workshop; 12 fishermen attended full time.

Two nets belonging to Newport fishermen were converted with all fishermen doing some of the actual work. This prepared them to work on their own.

More Sessions

Workshops were scheduled at Brookings and Astoria, Oregon, in February. These efforts have been received enthusiastically by the fishermen. It appeared that most of the Oregon shrimp fleet would be using separator trawls when the season opened March 1.

ALASKA

UNIQUE MARINE WEATHER FORECAST UNIT ESTABLISHED

BCF Juneau reports that the U.S. Weather Bureau, with Coast Guard and Navy cooperation, has established a forecast unit in Alaska reportedly the most sophisticated in the U.S. The unit is designed to supply weather information on a regular basis to mariners within 60 miles of the state's coastline.

Established in October 1969, the unit is the first of its kind in the U.S. It was a logical place to start the new program, says BCF Juneau, "because of the massive fishing and barging operations in Alaska--and because Alaska represents about 60 percent of the total U.S. coastline."

What Unit Does

The Weather Bureau provides information on "winds and general weather; issues a synopsis of the weather pattern; warns of any storms or other frontal activity which might be conducive to the formation of ice on vessels as the result of blowing spray; estimates visibility, particularly in fog, when it is expected to be reduced below three miles, and reports on sea ice where applicable."

Forecasts are issued for 6 areas:

- Southeast Alaska and North Gulf Coast
- Kodiak, Cook Inlet, and Alaska Peninsula, including Bristol Bay
- Pribilof Islands and southwest coast
- St. Lawrence Island, Norton Sound, Seward Peninsula, and Kotzebue Sound
- North Coast from Point Hope to Canadian Border
- Aleutian Islands

The unit is manned 24 hours a day by a 3-man staff.

* * *

'OREGON' STUDIES TANNER CRAB GEAR

A tanner crab gear research cruise was conducted from BCF's 'Oregon' near Kodiak Island by staff of BCF's Exploratory Fishing and Gear Research Base, Juneau, Alaska.

Principal objectives were: (1) to test relative efficiency of four pot types for capturing male tanner crab, and (2) to test relative effectiveness of different baits. A conical pot modeled after Japanese tanner crab pot was among types tested.

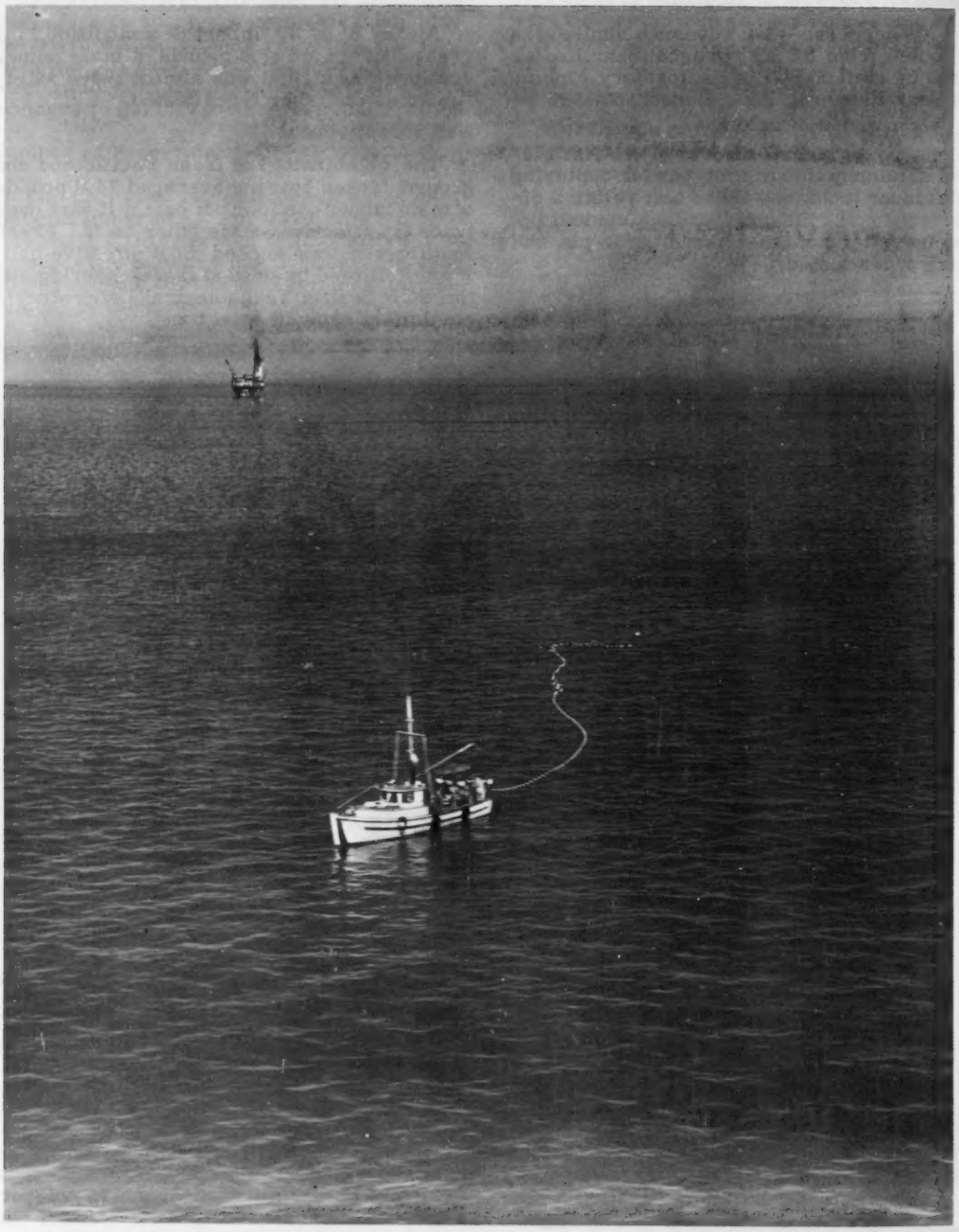
1 Pot Twice As Efficient

A 6' by 6' by 30" model of a modified king crab pot averaged 47.9 pounds of male tanner crab per pot catch; it was almost twice as efficient as the other types tested.

Bait Effectiveness

The combination of fresh Pacific cod and ground frozen herring averaged 74.9 pounds of male tanner crab per pot catch; it was over twice as effective as the other baits. Fresh Pacific cod was second most effective bait. It was followed by ground frozen herring and the BCF Seattle Technological Laboratory's emulsified experimental bait.

Kodiak, Alaska. (Photo: J. M. Olson)



A drift gillnetter and oil rig vie for space in Cook Inlet, Alaska. (BCF-Alaska photo: J. M. Olson)

WORLD DEMAND FOR SHRIMP & PRAWNS MAY OUTSTRIP SUPPLY DURING NEXT DECADE

Donald P. Cleary

Rising incomes in the United States have been an important determinant of sharp increases in the demand for shrimp. This same force--and associated improvements in distribution and use of frozen foods--is now creating a greater demand for shrimp throughout the world. The U.S. will have to compete increasingly with other countries for limited shrimp and prawn resources. Assuming demand in other countries increases at least as rapidly as U.S. demand, the world's estimated harvest potential of shrimp and prawns from known populations may be reached by 1980.

Rapid Growth in U.S. Shrimp Consumption

Since 1950, shrimp consumption in the United States has increased nearly 6% annually, on the average; it rose from 118.3 million pounds (heads-off weight) to 336.8 million pounds in 1968. On a per-capita basis, shrimp consumption increased from .78 pound to 1.68 pounds in that period. This is more than a 115% gain. In comparison, during 1950-1968, per-capita consumption of meat, poultry, and fish combined increased 19%--from 177 pounds to 210 pounds retail weight. Similarly, shrimp gained in popularity while per-capita consumption of all seafoods has remained relatively constant at 10 to 11 pounds.

Determinants of Shrimp Consumption

Past increases in the consumption of shrimp in the U.S. have been quite spectacular. What does the future hold? The answer to this question lies in an understanding of the determinants of shrimp consumption and how those determinants influence the level of consumption. Major determinants are price of shrimp relative to the general price level for consumer goods, price of competing foods, and income levels.

Statistical techniques make it possible to isolate and measure with some degree of precision the importance of these determinants of shrimp consumption. An application of these techniques indicates that income and price of shrimp are very influential determinants. These two factors, according to the analysis, accounted for 90% of the change in per-capita consumption since 1950. In the analysis, per-capita consumption was expressed as a mathematical function of per-capita personal disposable income and the retail price of shrimp adjusted by the consumer price index. Two important observations can be made from this equation:

(1) Each 1% gain in per-capita real income tends to be accompanied by a 1.77% increase in per-capita shrimp consumption.

(2) Each 1% increase (relative to general price level) in the retail price of shrimp tends to be accompanied by a 0.46% decline in per-capita consumption.

Knowing these relationships, we can predict with some reliability what consumption is likely to be--given changes in income and in price of shrimp.

Figure 1 shows actual per-capita shrimp consumption and estimated consumption for the period. Note how closely the equation is able to estimate per-capita consumption when price and income are known.

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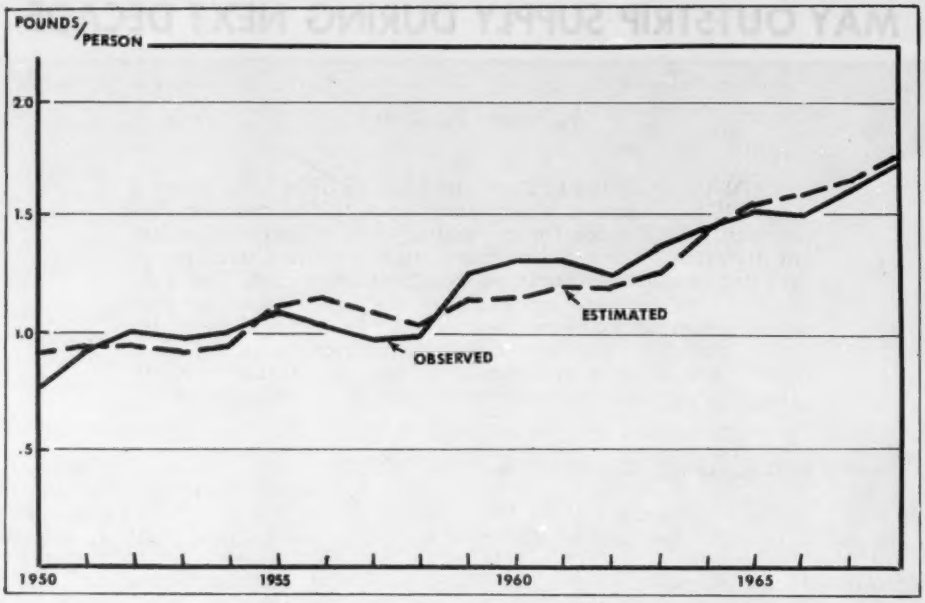

Fig. 1 - Actual and estimated per-capita shrimp consumption, 1950-1968.

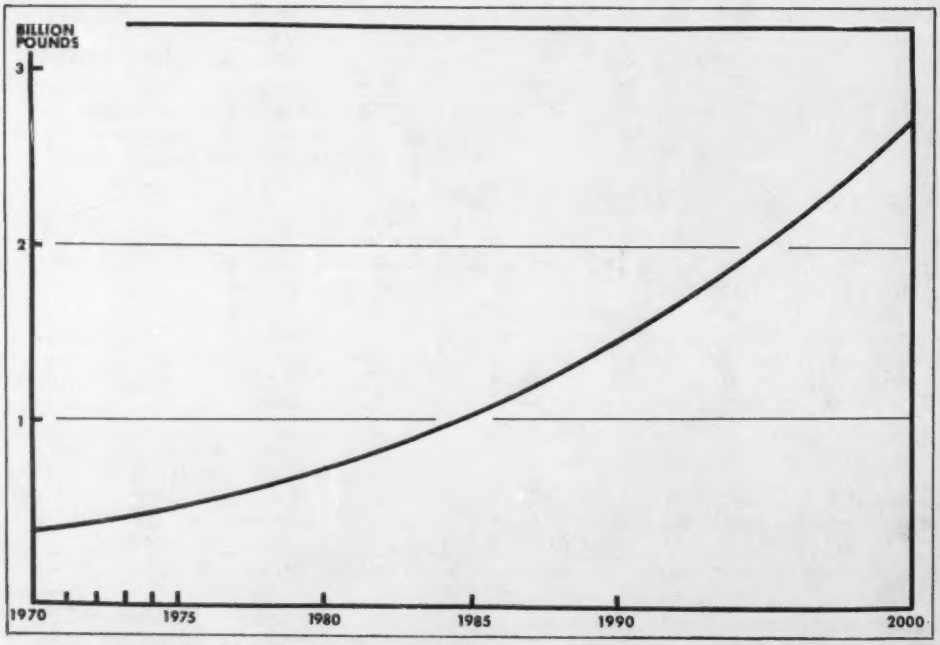

Fig. 2 - Projected total U.S. consumption of shrimp, 1970-2000 (heads-off weight).

During 1950 through 1968, "real" per-capita personal disposable income (adjusted for changes in general price level as measured by consumer price index) has risen relatively faster than retail shrimp prices; thus the rapid increase in per-capita consumption. Increases in the "real" price of shrimp have been moderated by world ability to develop new shrimp fisheries and to increase exports of shrimp to the United States. In 1950, shrimp imports were only 40% of domestic landings; by 1968, imports were 17% greater than total domestic landings.

World Demand for Shrimp and Prawns May Outstrip Supply by 1980

Using the consumption equation explained above, per-capita shrimp consumption was projected into the future by assuming 2 things: 1) "real" price of shrimp will not increase, and 2) a series of changes in income will occur as projected by the National Planning Association. Projected total consumption of shrimp in the United States is shown through the year 2000 in figure 2.

Based on the results of the analysis, per-capita shrimp consumption in the United States could reach 2.56 pounds, heads-off weight, by 1975, and 3.39 pounds by 1980. If we assume the world supply of shrimp is essentially unlimited--and if we can assume no change in past relation between income and demand for shrimp--then the analysis indicates that per-capita consumption would reach 5.30 pounds by 1990, and 8.80 pounds by 2000. Estimated per-capita consumption, multiplied by Census Bureau projected population, shows total U.S. consumption of shrimp can be expected to reach 562 million pounds (heads-off weight) in 1975, 797 million pounds in 1980 and, if supply is unlimited, 1.4 billion pounds in 1990, and 2.7 billion pounds in 2000.

It is a risky business to make projections far into the future on the basis of past and current relationships. Whereas per-capita real income most likely will continue to increase over the next 30 years, demand for shrimp may reach a saturation point. Even if supplies were sufficient to satisfy demand at a constant price, there is a probability that consumer tastes would change, or the influence of income and other forces on demand will change, and demand for shrimp would be altered.

As noted, much of the increase in per-capita consumption of shrimp in the U.S. can be associated with increasing affluence. Another factor has been advancement in the distribution and marketing system. Western Europe and Japan are experiencing rapidly increasing demands for shrimp for much the same reason as the U.S. And, similarly, these markets are supplying their increasing needs from imports. It is very likely that growth in world demand will grow more rapidly than expansion of shrimp and prawn harvesting.

A maximum estimate is that the world harvest of shrimp and prawns can be expected to increase only 88%. Such an estimate is based on known natural stocks and does not include the still-undetermined potential from aquaculture. Total world harvest potential is estimated to be 1.9 billion pounds, heads off. Estimated present world production of shrimp and prawns is slightly more than one billion pounds. This figure is an average for the mid-1960s, thus will understate present total world harvest.

United States consumption of shrimp in 1968 was 337 million pounds, or about one-third total world shrimp and prawn production. If the U.S. continues to consume one-third of world harvest, and if U.S. consumption increases as anticipated, then total world production must reach maximum potential of 1.9 billion pounds by late 1970s.

Excess Demand Will Be Moderated By Price Increases

Real personal disposable income is expected to increase at about 3% per year during the 1970s and 1980s. Since per-capita consumption increases 1.77 times as fast as per-capita personal disposable income, we can anticipate an increase in per-capita demand of over 5% per year. Also, population is expected to increase slightly more than 1% per year through the 1970s and 1980s. The combined effect of increasing real income and increasing population should result in a 6-7% growth per year in total demand. To offset increasing demand--and to hold total consumption constant after maximum harvest potential is reached--real price will have to increase by about 15% per year.

Certainly price increases will be strong when production is no longer able to keep

pace with increases in demand. Price increases should be expected to accelerate considerably before potential harvest is realized. With current technology, and at current prices, not all the world's shrimp resources will be profitable to harvest. Only with increasing prices will there be sufficient stimulus to develop new grounds and to harvest high-cost areas.

The possibility of shrimp and prawn harvests leveling off in the next decade while demand continues to climb is quite real. Shortages in natural supplies will force increasing attention to aquaculture. As prices increase, the development and use of higher cost methods will be stimulated. This illustrates the importance of considering future returns to aquaculture in planning development of U.S. and world estuarine areas.

"Clean" catch consisting predominantly of pink shrimp.

EXPLORING FOR SCHOOLING PELAGIC FISHES IN MIDDLE ATLANTIC BIGHT

Jackson Davis

An exploration for schooling pelagic fishes was conducted by the Virginia Institute of Marine Science (VIMS), Gloucester Point, Virginia, in the waters of the continental shelf between Cape Hatteras, North Carolina, and Block Island, Rhode Island, during Feb. 9-May 14, 1969. It was done under research grant sponsored by the Bureau of Commercial Fisheries, Washington, D.C.

Fish schools detected by sonar were small and transitory. Rough seas, especially in February and March, make two-boat purse seining of doubtful practicality.

The exploration was conducted from the menhaden vessel 'W. T. James Jr.' under charter to VIMS. The 187-foot, 500-ton James was equipped with a Simrad SK3 sonar and CK2 scope. A skiff, powered by an outboard motor, was equipped with a Simrad Basdic. Fishing gear was a purse seine 250 fathoms long and 1500 meshes, 1.5 inch stretched, deep rigged as is usual for menhaden purse seines. The net was fished by the technique standard in the menhaden industry: half the net is set from each of 2 purse boats traveling in a semicircle around a school. The purse boats were 37 feet long overall and 10 feet wide, powered by diesel engines--and equipped with hydraulic masts and booms, and Marco model 29A power blocks to handle the net.

Area Explored

Different portions of the Mid-Atlantic Bight were explored in 7 cruises about 10 days each. Cruise tracks were developed in response to the prevailing weather as each cruise progressed. To the extent allowed by weather, the entire shelf was examined, but little time was spent in water deeper than 40 fathoms.

In February and early March, the major concentration of fish was in 15 to 30 fathoms between Cape Hatteras and Cape Henry, Virginia. A secondary concentration was in 10 to 15 fathoms between Parramore Banks (37°30' N) and Jack's Spot (38°10' N). Fish were detected by sonar but usually not caught--because they were not schooled, or because rough seas precluded setting the net. However, both fish behavior and scanty observations of the catches by foreign trawlers indicated they were mostly herring and mackerel.

A fleet of 75 to 125 or more Soviet and Polish trawlers fished these concentrations and followed the migrating herring and mackerel during March, April, and May as they moved northeasterly along the 30-fathom curve. The foreign fleet apparently had good information concerning the whereabouts of fish. We found by steaming through and around the fleet that the distribution of trawlers on the surface very closely approximated the distribution of fish beneath the surface. Usually the fish were in a band 5 to 10 miles wide and 30 to 50 miles long in 25 to 35 fathoms.

Fish Behavior & Purse Seining

Purse seining was practical only twice each day when fish were schooled briefly. At other times, they were too dispersed to be caught in a purse seine. For an hour or a little more before dawn, fish were schooled and the schools were in suitable position to be caught by seining. However, with the first light of dawn, the schools broke up and the fish settled to the bottom individually and in small groups. In late afternoon, fish regrouped into schools which stayed deep in the water until sunset, when they rose rapidly to the surface and dispersed. Thus fish were schooled and in suitable position to be caught in purse seines for two periods, each of two hours or less, in each 24 hours. During the 20 or more hours that fish were not available to a purse seine, they appeared to be suitably positioned for capture with a universal trawl.

Mr. Davis is associated with the Virginia Institute of Marine Science, Gloucester Point, Virginia 23062.
Virginia Institute of Marine Science Contribution No. 337.
Note: Mention of equipment does not constitute endorsement by the Federal Government.

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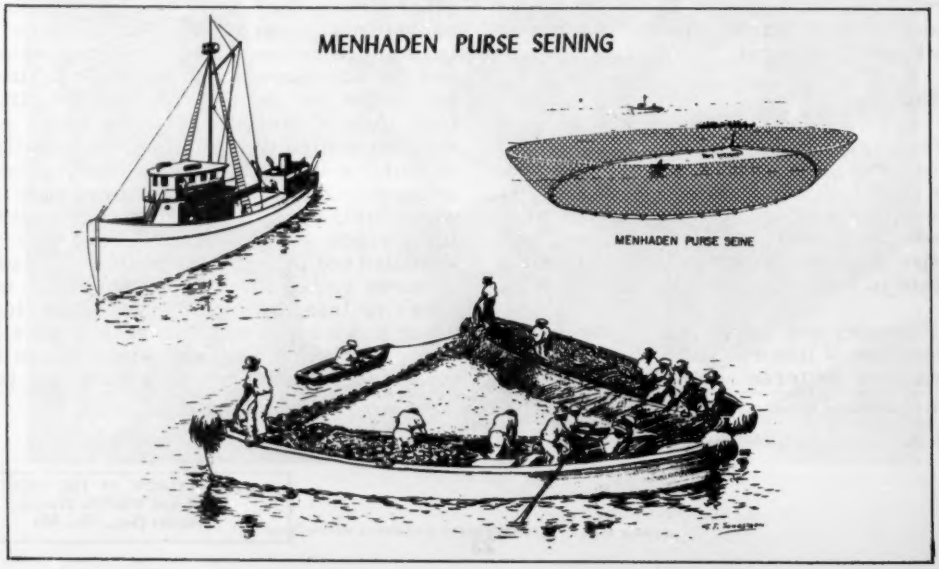
Fish remained schooled only briefly, so it was necessary to set the net quickly. Our technique was first to locate a school with the sonar. Then we sent the basdic-equipped skiff to relocate the school and stay above it. The skiff served as a target for the purse boats to set the net around. Unfortunately, relocating the school by basdic operator in the skiff was time-consuming, despite radio communication between the ship's pilot house and the skiff's basdic operator. It seems that setting the seine from purse boats would be more efficient. On several occasions, schooled fish dispersed while the basdic operator was attempting to position the skiff over them. Dispersal seemed to be in response to changing light intensity, rather than to the presence of the skiff. We believe this is so because we also observed dispersal of schools at dawn and dusk when the skiff was not overboard.

Perhaps schooling behavior would be somewhat different if a large trawler fleet were not present. Schools might be larger and they might maintain their integrity better. The largest school detected in 1969 was about 60 yards wide. But, in 1966 and 1967, when only 25 or fewer foreign trawlers were working, we detected several schools larger than 50 yards and one at least 6.5 miles.

1969 Program's Aim

The field program in 1969 was aimed at finding resources that could be harvested by the menhaden fleet during its off-season. Therefore, it was terminated in mid-May when menhaden fishing usually begins. Information acquired from various sources, mostly Coast Guard-BCF surveillance flights, suggests that herring become more vulnerable to purse seines in May and June. An observer sighted schools of fish, probably herring, south of Long Island in mid-May. Near June, the USSR added to its fleet about 40 purse seiners that fished on Georges Bank.

Sea conditions are important to the success of a purse-seining operation. Purse boats are not suited to winter's rough seas. The number of days at sea were: February-15; March-23; April-17; and May-10. In February, seas were calm enough to operate purse boats only 20% of the days at sea. In March, 40% of the days were suitable. As spring progressed, conditions improved. In April, 60% of the days were suitable and, in May, 70%. These percentages reflect the fact that it was often possible to work near shore when seas were too rough in deeper water. Working conditions were less favorable along the 30-fathom curve where fish were most abundant.



PACIFIC OCEAN PERCH & HAKE STUDIED OFF WEST COAST

Thomas A. Dark, Herbert H. Shippen, & Kenneth D. Waldron

From January through March 1969, BCF's 'Miller Freeman' conducted fishery research off Washington, Oregon, and California (Cruise No. F69-01). Her major objectives were to obtain data on: (1) distribution, age, size, sex composition, and relative abundance of Pacific ocean perch (Sebastodes alutus) off Washington and Oregon; (2) distribution and relative abundance of eggs and larvae of commercially important fish, particularly Pacific hake (Merluccius productus), off California; and (3) distribution and relative abundance of juvenile Pacific hake off southern California.

RESEARCH ON PACIFIC OCEAN PERCH

Historically, the Pacific ocean perch has been one of the most important rockfishes in the Pacific Northwest trawl fishery. Perch grounds off Washington and Oregon are not as extensive as those off Alaska; nevertheless, until recently, the former supported a fishery important to the economies of both states. During the past several years, increased local demand and foreign exploitation of Pacific Northwest groundfish resources have reduced perch stocks to where few U.S. fishermen find it profitable to continue fishing these grounds.

BCF Seattle, Wash., responded to this serious problem by initiating a field program in 1968 to study facets of the Pacific ocean perch: its distribution and abundance, growth and mortality, relation to the environment, size of its standing stock, and the response of the stocks to various rates of fishing. Ultimately, such information will allow estimates of the level of fishing that will maximize the harvest on a sustained basis. These estimates are required before a sound management program can be implemented.

This research cruise was the first in a series to assess Pacific ocean perch stocks off Washington and Oregon and to monitor changes in response to varying fishing rates.

Sampling for Pacific ocean perch began Jan. 8, 1969, and ended on the 24th. Weather was poor at times--but never severe enough to restrict operations. Fishing was conducted in statistical areas designated by the Pacific Marine Fisheries Commission and the U.S.-USSR fishery agreement of 1967 (fig. 1). In areas 12 to 15, drags were started at about 125, 150, 175, and 200 fathoms; in areas 10, 11, this sampling scheme had to be modified because suitable trawling grounds were limited.

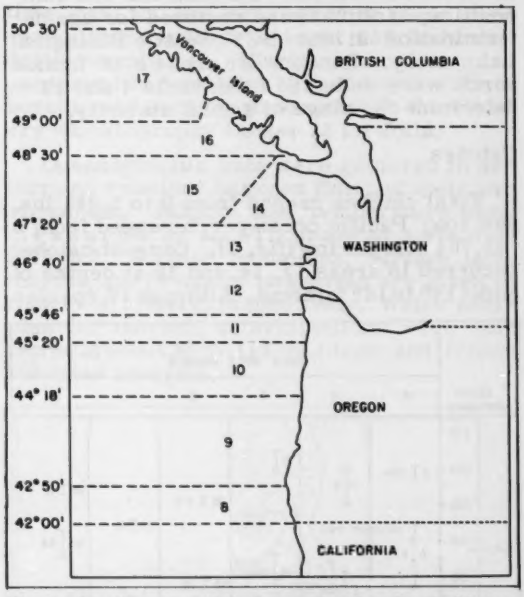


Fig. 1 - Locations of statistical areas based on Pacific Marine Fisheries Commission areas and areas designated in the U.S.-USSR fishery agreement of 1967. The Miller Freeman trawled in areas 10 to 15 on cruise F69-01.

Fishing Gear and Sampling Procedures

The vessel fished with a BCF Mark I Universal Trawl of $2\frac{1}{2}$-inch mesh (stretched

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measure included one knot) in the body and 3-inch mesh in the cod end; the cod end was lined with $1\frac{1}{8}$-inch mesh. The trawl was fitted with 7 by 12-ft. V-doors; during fishing, the nominal dimensions of the trawl mouth were 45 ft. wide by 23 ft. high. Rollers (bobbins) attached to the groundline permitted fishing on rough bottom; a depth-sensing system measured the depth the net was fished. The relative abundance of fish, as well as bottom depth, was determined with a newly installed 800-fathom depth sounder. Tows were made at $1\frac{1}{2}$ to $2\frac{1}{2}$ knots for 30 minutes.

Catches were sorted by species, and total weight of each type of fish determined. Samples of Pacific ocean perch were taken from the catch and examined for size and sex composition; otoliths were removed for age determination at the BCF Seattle Biological Laboratory. Random samples of female perch were collected from hauls 4 and 13 to determine the stage of sexual maturity.

Catches

Total catches ranged from 0 to 5,946 lbs. per tow; Pacific ocean perch ranged from 0 to 1,764 lbs. per tow (fig. 2). Largest catches occurred in areas 13, 14, and 15 at depths of about 145 to 185 fathoms. Although 17 species of rockfish were caught, only Pacific ocean perch were taken in large numbers. Other large catches included: (1) 5,300 lbs. of Dover sole (Microstomus pacificus) taken at 200 fathoms in area 15, (2) about 2,000 lbs. of spiny dogfish (Squalus acanthias) at 125 fathoms in area 14, and (3) 2,500 lbs. of spiny dogfish at 160 fathoms in area 11.

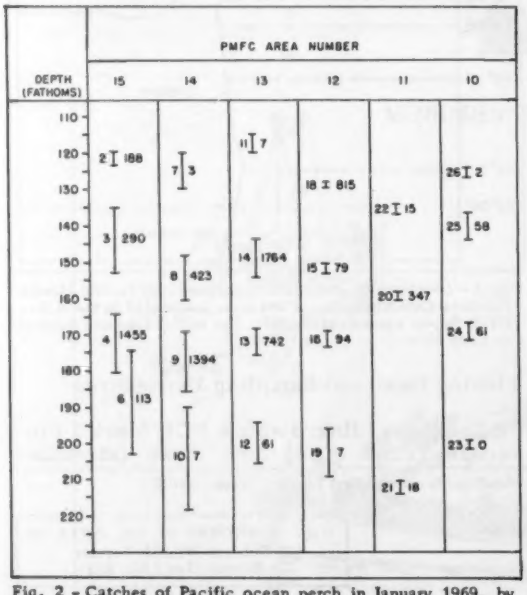

Fig. 2 - Catches of Pacific ocean perch in January 1969, by depth of trawl and statistical area. Number to left of depth range designates haul number; number to right is weight (lbs.) of catch.

An estimated 68 percent of the female Pacific ocean perch were sexually mature; most had eggs in advanced stages of development, but evidently none had spawned in 1969. Some fish were preserved for racial studies.

Fulfillment of objectives must await comparison of present data with similar information that will be gathered on future cruises.

PACIFIC HAKE--EGGS AND LARVAE

Only recently has the Pacific hake become the object of an important fishery. Since 1966 it has been caught by U.S. and Soviet vessels fishing along the Pacific Northwest coast. Hake catches have been processed for fish meal, but they will be used as a primary source of fish protein concentrate (FPC) when an FPC pilot plant at Aberdeen, Washington, becomes operational in the near future. Foreseeing the need for management of this fast-growing fishery, BCF began an intensive research program. One phase is collection of information concerning the hake's early life history, the eggs and larvae, particularly their distribution and abundance.

Knowledge of the distribution and abundance of hake eggs and larvae is important in three ways: (1) it enables determination of the distributional characteristics of the spawning population; (2) it allows for estimates of the size of the spawning population; and (3) it provides a basis for prediction of the contribution of present broods to the fishery several years hence.

The first benefit: Information on distribution and schooling habits might allow exploitation of the spawning population. All current evidence indicates that hake spawn at considerable depths and are dispersed over a large area; therefore, commercial exploitation during the winter spawning season does not appear feasible. Also, by gathering information on spawning, we may gain insight into the racial composition of the fishable population, which is important in establishing a management program.

Second benefit: An estimate of the spawning population size would provide a preliminary measure of the size of the fishable population because most fish available to the present fishery are adults. Stock size is another type of information important in computing the maximum sustainable harvest.

Third benefit: The adult Pacific hake population is composed of relatively few age groups. So a particularly large or small age group entering the fishable population has great significance in terms of the abundance of hake available to fishermen. There is considerable evidence that age groups vary greatly in size. Therefore, it would be valuable to fishermen, processors, and fishery managers to have advance information on expected stock size. Sampling the early life stages (eggs, larvae, and juveniles) may provide reliable forecasts of age group strength.

From Jan. 25 to Feb. 17, a cooperative U.S.-USSR survey of Pacific hake eggs and larvae was conducted off California, at plankton stations of CalCOFI (California Cooperative Oceanic Fisheries Investigations). Other organizations participating were the BCF Fishery-Oceanography Center and the Scripps Institution of Oceanography at La Jolla, Calif., and TINRO (Pacific Scientific Research Institute of Marine Fisheries and Oceanography) at Vladivostok, USSR. Sampling was begun off Pt. St. George. It was interrupted by a 2-day port call to San Francisco (Feb. 10-11) for supplies and change of scientific personnel. It was completed just north of Pt. Conception (fig. 3).

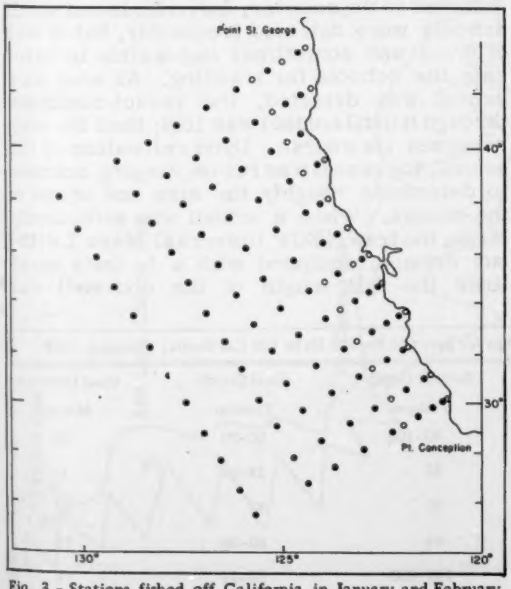

Fig. 3 - Stations fished off California in January and February 1969 to study the distribution and abundance of eggs and larvae of fish. Open circles- plankton tow stations, solid circles plankton tow and STD stations.

The plankton sampling gear used off California, of CalCOFI design, consisted of two nets mounted on a single frame. One net of 505-micron mesh had a mouth diameter of 3.3 ft. (1 m.); the other, of 333-micron mesh, had a mouth diameter of 1.6 ft. ($\frac{1}{2}$ m.). Each net was equipped with a flow meter; on most tows, a bathykymograph recorded the depth-time path of the net. Oblique tows were carefully controlled to about 656 ft. (water depth permitting). Plankton samples were preserved in formalin, buffered with sodium borate, and sent for processing to the Fishery-Oceanography Center at La Jolla.

Oceanographic data were gathered to determine relations between fish and their environment. Salinity and temperature were measured by an STD probe to 1,986 feet (600 m.). Surface isohalines, surface isotherms, and 10-meter isotherms are given in figures 4, 5, and 6, respectively. Water samples for nutrient determinations were collected at about 30-ft. (10-m.) depth and frozen for later analysis.

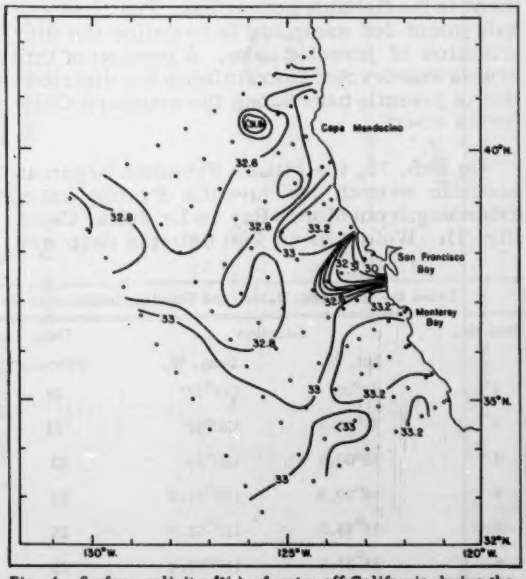

Fig. 4 - Surface salinity (‰) of water off California during the study of fish eggs and larvae in January and February 1969.

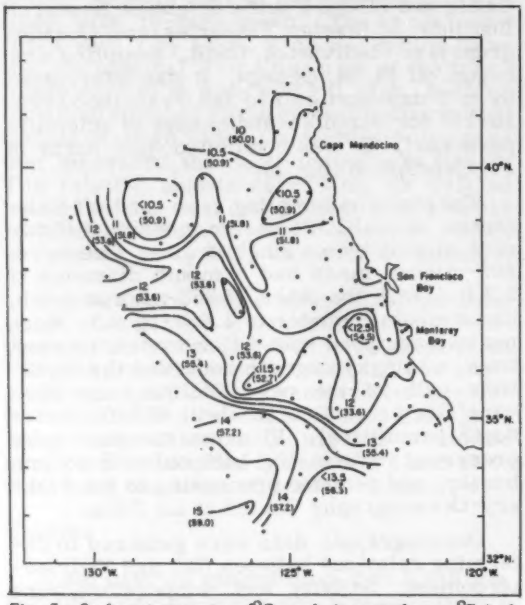

Fig. 5 - Surface temperature (°C. and, in parentheses, °F.) of water off California during the study of fish eggs and larvae in January and February 1969.

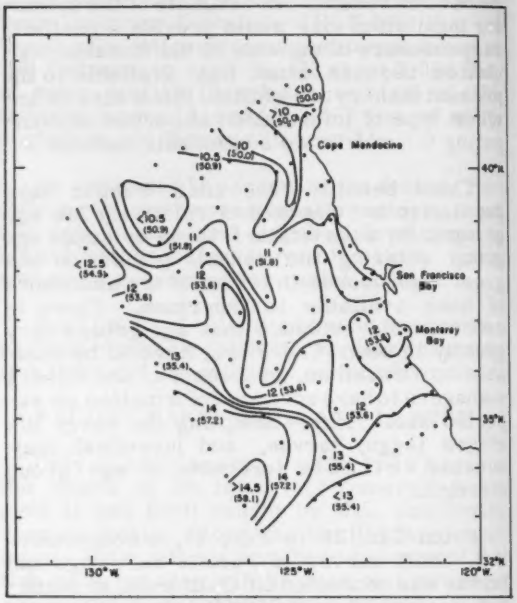

Fig. 6 - Water temperature (°C. and, in parentheses, °F.) at a depth of 33 feet off California during the study of fish eggs and larvae in January and February 1969.

PACIFIC HAKE--JUVENILES

The abundance of juvenile hake (post-larva stages) might also be used to forecast recruitment to the fishable population. The first requirement for sampling is to define the distribution of juvenile hake. A portion of this cruise was devoted to examining the distribution of juvenile hake along the southern California coast.

On Feb. 19, the Miller Freeman began an acoustic search for juvenile Pacific hake, extending from Morro Bay to La Jolla, Calif. (fig. 7). Water 30 to 200 fathoms deep was examined at vessel speeds of 6 to 10 knots. Large concentrations of fish were seldom detected on the sounder. Individuals and small schools were detected frequently, but it was difficult and sometimes impossible to relocate the schools for trawling. As soon as a school was detected, the vessel continued through it until contact was lost; then the ship reversed its course. Upon relocation of the school, the vessel was run on varying courses to determine roughly the size and shape of the school. When a school was sufficiently large, the trawl (BCF Universal Mark I without rollers, equipped with a 1 -inch mesh liner the full length of the cod end) was

Table 1 - Locations, Dates, and Trawling Information for Drags for Juvenile Pacific Hake Off California, February 1969

Haul No.	Location		Date	Bottom Depth	Haul Depth	Haul Duration
	Lat. N.	Long. W.	February	Fathom	Fathom	Minute
1	34°05'	119°37'	19	80-100	60-70	59
2	35°15.7	120°57	21	35	28-32	70
3	35°00.2	120°46	22	40	30	99
4	34°10.8	119°21.2	23	44	20-36	71
5	33°33.5	117°52.7	25	160-200	16-34	78
6	33°31.5	117°58.4	25	120-180	4-30	106

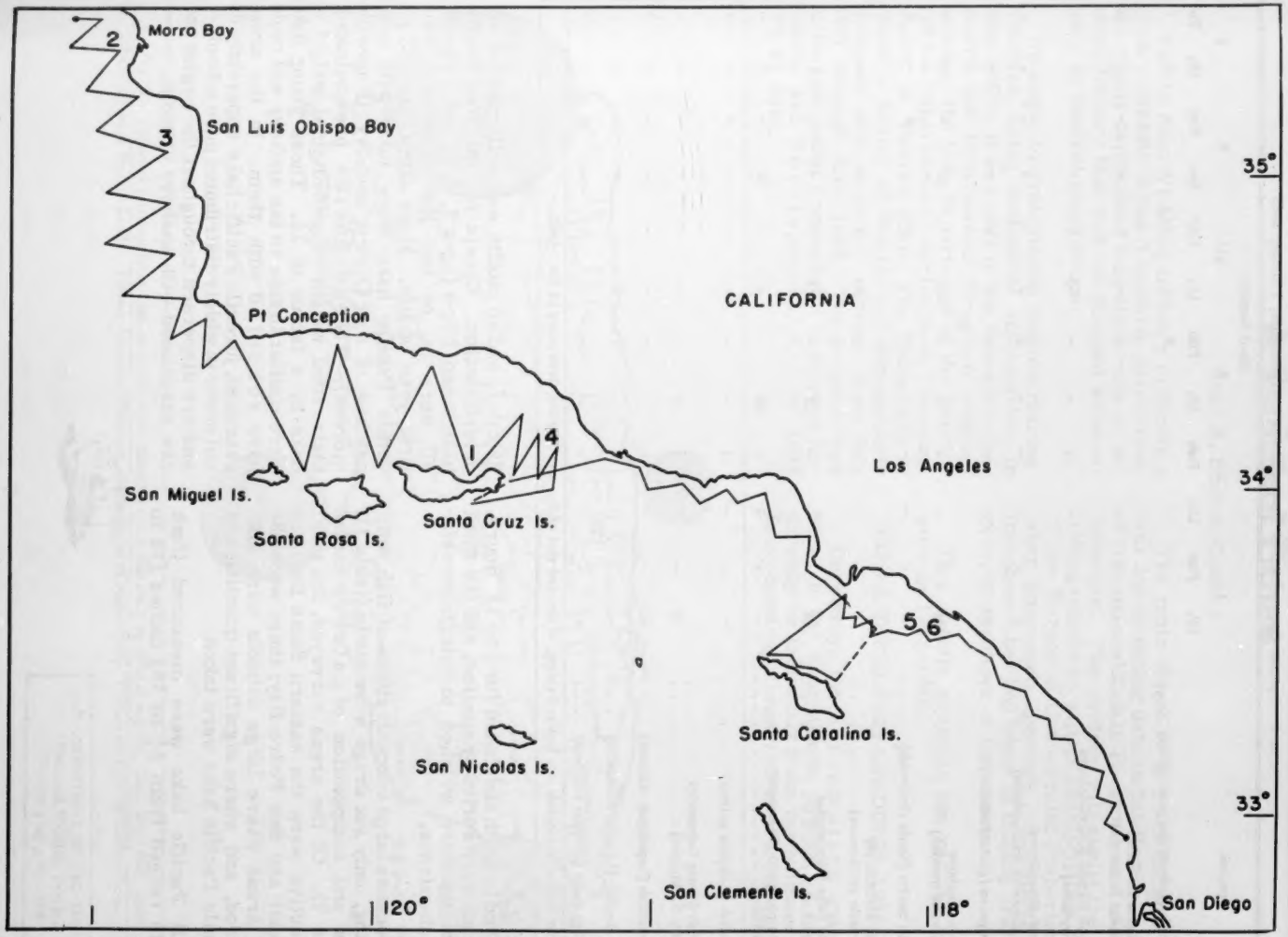

Fig. 7 - Search pattern used for juvenile Pacific hake off California in February. Numbers along the cruise tract designate fishing (trawl) sites.

Table 2 - Species Composition of Trawl Catches Off California, February 1969

Species	Haul Number 1		2		3		4 1/		5		6	
	Lb.	Fish	Lb.	Fish	Lb.	Fish	Lb.	Fish	Lb.	Fish	Lb.	Fish
Bocaccio (Sebastodes paucispinis)	-	-	-	-	-	3	-	-	-	-	-	-
California lizardfish (Synodus lucioceps)	-	-	-	-	-	-	-	6	-	-	-	-
Chinook salmon (Oncorhynchus tshawytscha)	-	-	-	-	-	-	23	1	-	-	-	-
King-of-the-salmon (Trachipterus trachypterus)	-	-	-	-	-	1	-	-	-	-	-	-
Midshipmen (genus Porichthys)	36	-	-	-	1	-	-	-	-	-	-	-
Northern anchovy (Engraulis mordax)	469	-	-	-	-	-	659	-	20	-	195	-
Pacific bonito (Sarda chiliensis)	-	-	-	-	-	-	-	3	-	8	-	9
Pacific electric ray (Torpedo californica)	-	-	-	-	-	1	-	3	-	-	-	-
Pacific hake (Merluccius productus)	28	-	-	-	.5	-	21	-	-	-	6	-
Pacific pompano (Palometa simillima)	-	-	9	-	26	-	-	-	12	-	7	-
Queenfish (Seriphus politus)	-	-	-	1	-	-	-	-	-	-	-	-
Rockfish (genus Sebastodes mostly S. jordani)	38	-	2	-	-	-	-	-	-	-	-	-
Scabbardfish (Lepidopus xantusi)	-	-	-	-	-	-	-	-	-	-	-	3
Spiny dogfish (Squalus acanthias)	-	-	-	-	-	1	-	-	-	-	-	-
Thresher shark (Alopias vulpinus)	-	-	-	-	-	-	-	1	-	1	-	-

1/About half of the catch was lost in hauling of the cod end of the trawl up the stern ramp of the vessel.

lowered to depth and fished for 1 to 1½ hours. Catches were sorted by species, and the most numerous were weighed to determine relative abundance.

Because large concentrations of fish were lacking, only six drags were made (table 1); sizes and composition of catches varied (table 2). Of the areas surveyed, the most productive were the eastern Santa Barbara Channel and San Pedro Bay; these were the only areas where large schools were discovered, and where significant quantities of juvenile Pacific hake were taken.

All Pacific hake were measured (fork length ranged from 5½ to 15½ inches [14 to 39 cm.], and an otolith was collected for age determination. Except for the four Pacific hake in haul No. 4 (ages 2, 4, 6, and 7 years), all were in, or had just completed, their first year of life. More often than not, juvenile Pacific hake were taken with large catches of northern anchovy (Engraulis mordax). The anchovies predominated: their total weight exceeded total weight of hake by a factor of 24. These young hake were similar in size to the anchovy and could have schooled with them. In the areas searched, juvenile Pacific hake apparently do not occur in widely distributed pure schools--and are dispersed throughout the region and are associated with anchovy schools.

PUERTO RICO'S COMMERCIAL MARINE FISHERIES

A Statistical Picture

José A. Suarez-Caabro

Puerto Rico's fishing industry presents a great contrast: it has a modern, productive, and highly capitalized tuna fleet--and an inshore fishery that has not changed substantially in several generations.

We began to evaluate the inshore marine fisheries, using statistical information, in June 1967. It was part of the Fisheries Research and Development Program cosponsored by the U.S. Department of the Interior and the Department of Agriculture, Commonwealth of Puerto Rico. The University of Miami's School of Marine and Atmospheric Sciences was technical adviser from July 1967 through June 1969. The program was authorized under Commercial Fisheries Research and Development Act of 1964 (PL 88-309).

The main objective is to establish a system for obtaining data on landings and sales of fish and shellfish in Puerto Rico's inshore fisheries. The system will assist the local fishing industry--and fill the statistical needs of the Bureau of Commercial Fisheries and other interested agencies. Statistical data include number and types of fishing craft and gear, and number of fishermen.

This article presents the results of our work in 1968-1969.

FISH & SHELLFISH LANDINGS, 1968-1969

Currently, the information gathered through the sale tickets system is coming directly or indirectly from many fishermen. In my opinion, at least 70% of total landings are

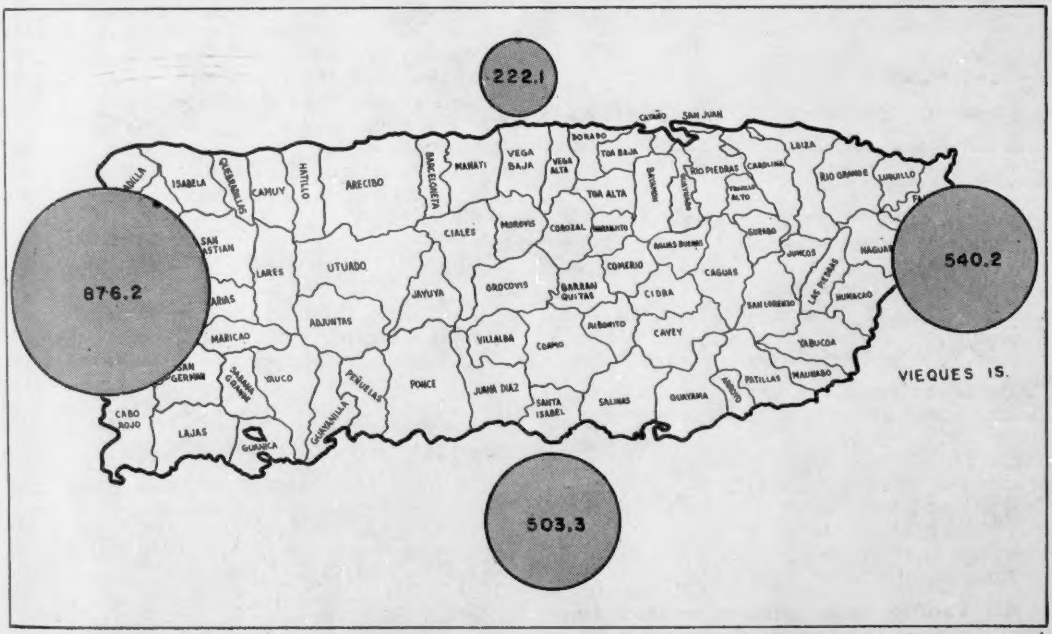

Fig. 1 - Reported landings from inshore commercial fisheries (in 1,000 lbs.) by coastal regions, Oct. 1967-Oct. 1969.

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being collected by this method. However, a very important goal of our project is to determine this percentage with greater accuracy.

Distribution of Landings

Production is highest on the west coast of island and lowest on the north coast (Figs. 1 & 2). Since statistical program was started in October 1967, Cabo Rojo alone has produced consistently nearly 30% of the island's reported landings of fish and shellfish--and about 23% of exvessel value.

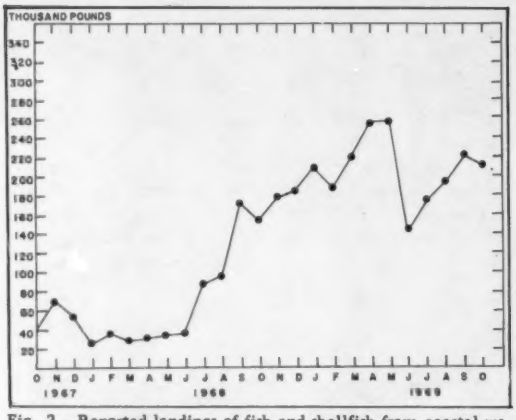


Fig. 2 - Reported landings of fish and shellfish from coastal waters, Oct. 1967 through Oct. 1969.

After Cabo Rojo, the more productive fishing centers were Vieques Island and Fajardo (east coast), Guanica and Lajas (south west coast), Aguadilla and Mayaquez (west coast), and Naguabo and Humacao (east coast). Cabo Rojo and the above areas together produce 66% of Puerto Rico's total reported production.

The average price paid to fishermen, for fish and shellfish combined, July 1968-June 1969, was 28 cents. The lowest (23 cents) was recorded on the west coast; the highest (38 cents) on north coast.

Fish represent 87.6% of the weight (Fig. 3) and 73% of the exvessel value of the landings. Of the shellfish, spiny lobster (including some sand lobsters) was most abundant--8.4% by weight and 22% by value. It also brings the highest exvessel price per pound (74 cents) of any fish and shellfish; land crab is close behind at 64 cents per pound. The remaining 4% of landings were other shellfish and turtle. These values represent averages for the island, but price per pound varies regionally.

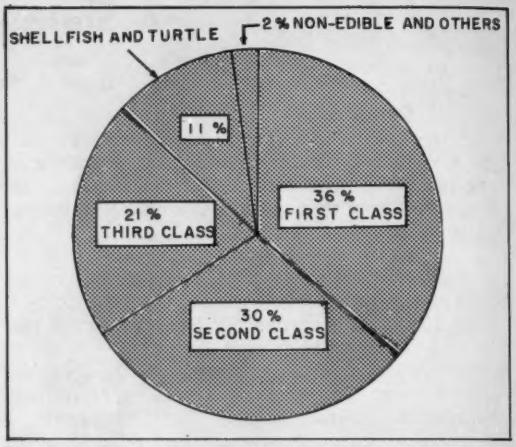


Fig. 3 - Distribution of marketing classes of fish and shellfish reported from coastal waters, July 1968-June 1969.

Information is available for the past two years, but reliable data are not. It is difficult and premature to try to make accurate estimates of annual production and seasonal variation. If magnitude of reported landings of previous years is compared with July 1968-May 1969 data, it can be concluded that figures have increased steadily since July 1968 (Fig. 2). However, it is still questionable whether this increase represents part of a seasonal cycle of availability of fish and shellfish--or simply an improvement in data acquisition, or both.

Composition of Catch

Accurate information on catch composition is extremely difficult to obtain because of the diversity of species in the catches and the lack of fish-landing records kept by fish dealers and fishermen. The author has seen 15 to 20 species in one catch. However, during 1969, the statistical agents gathered much information on composition by species.

In Puerto Rico's coastal waters, there are roughly 130 species of commercially important fish, including all market classes. About 30 are first class, but the most common are: hogfish, Lachnolaimus maximus; king mackerel, Scomberomorus cavalla; trunk-fishes, Lactophrys spp.; Nassau grouper, Epinephelus striatus; silk snapper, Lutjanus vivanus; yellowtail snapper, Ocyurus chrysurus; dolphin, Coryphaena hippurus; yellowfin grouper, Mycteroperca venenosa; mysty grouper, Epinephelus mystacinus; blackfin snapper, Lutjanus buccanella; wahoo, Acanthocybium

solandri; barracuda, Sphyraena barracuda; snook, Centropomus undecimalis, and mutton snapper, Lutjanus analis.

The most common classified fish are: snapper (35%), mackerels (28%), and groupers (12%).

Shellfish are represented mainly by 74% spiny lobster, Panulirus argus; 11% conch, Strombus gigas; 8% sea turtles, Eretmochelys imbricata, Caretta caretta, Chelonia mydas and Dermochelys coriacea; 5% octopus, Octopus vulgaris; and 2% land crab, Cardisoma quanhumi.

FISHERMEN, CRAFT, AND GEAR

At every fishing center, the number of fishermen, craft, and gear was surveyed during April-Sept. 1969.

The total number of fishermen was determined on the basis of information in 2,131 fishing license applications for fiscal year 1968-1969. Interviews were based on three main questions: fisherman's status (regular, casual, deckhand), type of boat (name, registration number, propulsion, dimensions), and type of gear (number, quantity).

There were 991 fishermen: regular, casual, and deckhand (regular or casual). A regular fisherman receives at least 50% of income from fishing, or spends half his working time at it. There were 787 fishing boats (motor and other).

On the entire island, 38% of the fishermen were regular, 62% casual. Most fishermen were boat owners: 80% of regular, and 69% of casual.

The distribution of regular fishermen by region is significant. The west coast, most productive area, had highest number (34%). The lowest number (15%) was on north coast, lowest production area.

Of fishing craft, 76% are boat-motor, and 24% boat-other (sail, row, motor and sail). The highest number of motor boats are on the south coast (33%), followed by east (25%), north (23%), and west coast (19%).

A few fishing boats are driven by sail or motor and sail (Fig. 4). Sail boats are 3% of

Fig. 4 - Twenty-seven-foot motor and sail fishing boat at El Combate, Cabo Rojo.

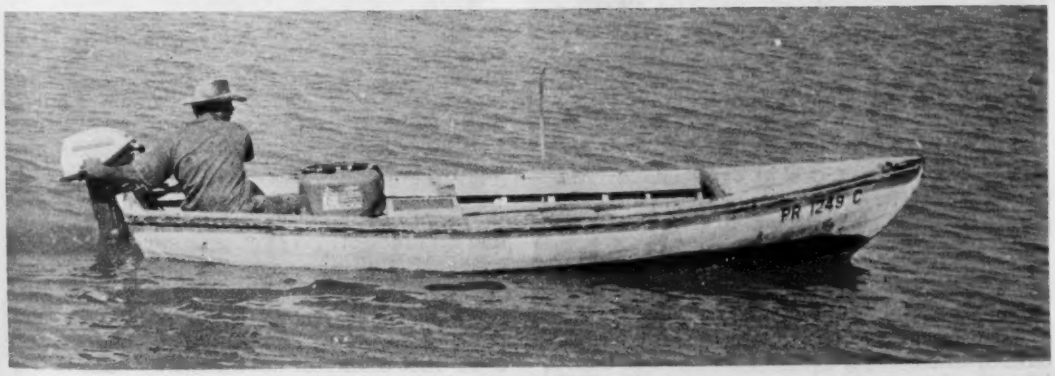


Fig. 5 - Sixteen-foot outboard motor fishing boat called "yola" is the most popular fishing craft.

boat-other, and motor and sail only 11%. Row boats are about 85%: the highest number in the north coast (38%), followed by west (30%), east (18%), and south (14%) coasts.

The most popular commercial fishing boat is the "yola" (Fig. 5). It is largely a flat-bottom skiff of the dory type, small, roughly constructed, and with a restricted cruising range. About 57% of all fishing boats are 16 to 18 feet long. The most common mode of propulsion is the outboard motor, 6 to 10 horsepower (38%).

In Sept. 1969, inshore fishing gear of all types totaled 12,125 units, divided as follows:

Fish pot (62.8%): most common. It is generally arrow-head shaped, with one downward curving entry funnel at apex. This funnel is tapered to prevent escape of the catch (fig. 6). The pot is about 5 feet long, 5 feet wide, and 1.5 feet high; it is constructed of mangrove pole frames and galvanized chicken wire. It is fished as single unit with a separate buoy line or several buoys attached to one main line.

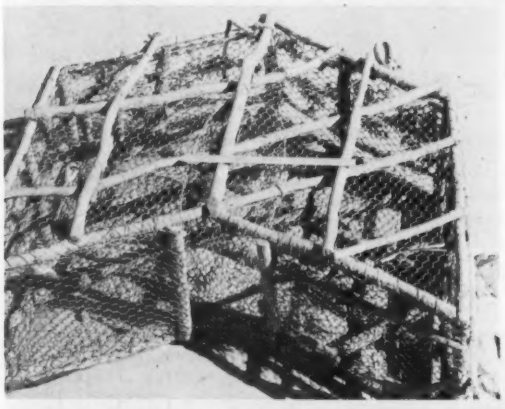


Fig. 6 - Conventional fishing pot at El Combate, Cabo Rojo.

Troll line (9%): a long single line, with one or more barbed hooks at free end of line, baited with either natural or artificial lure, and towed behind moving boat (fig. 7).

Hand line (6.2%): a single line with one or more hooks held or attended by one fisherman. At end of line, 4, 6, or 8 hooks are hung from a hard frame of galvanized wire ("ballestilla"), with 3- to 5-lb. lead attached to center (fig. 8).

Fig. 7 - Troll line with spoon used at La Puntilla, Cataño.

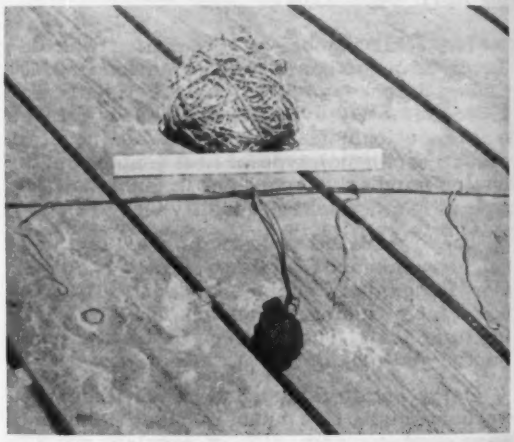


Fig. 8 - Hand line for fishing silk snapper at El Combate, Cabo Rojo.

Spiny lobster pot ("cajon," 5.3%): restricted to a few fishing centers. Various designs and dimensions resembling fish pots described before (fig. 9). One type is made of galvanized chicken wire and mangrove poles. Typical Florida-type wooden lobster pots have been introduced in recent years. About 32 inches long, 25 inches wide, 16 inches high, they are constructed of precut cypress slats and 1 x 1 inch strips of pine or spruce (fig. 10).

Cast net (4.7%): Almost every fisherman has one cast net ("Atarraya") for catching small bait fish. It is a circular, cone-shaped, 6-15-foot diameter net thrown by hand to trap fish. The leads on net's outer edge sink

rapidly to bottom, entrapping fish. The net is then recovered by slowly pulling the recovery line attached to its center.

Turtle net (4.6%): a special type of gill net ("volante" or "chinchorro de carey") for catching sea turtles. A single wall of net 4 to 6 yards deep by 20 to 80 yards long; mesh is 20 to 24 inches, stretched measure.

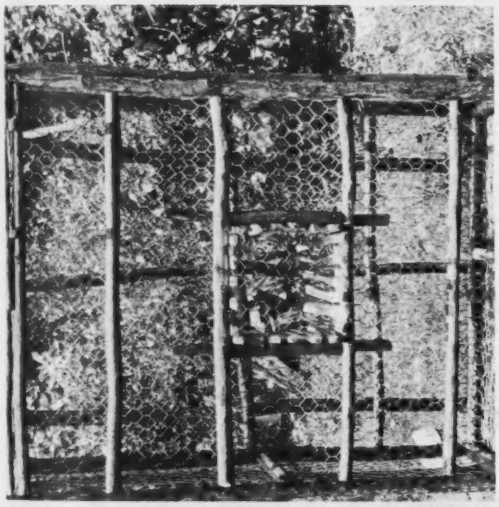


Fig. 9 - Spiny lobster fishing pot at Las Croabas, Fajardo.

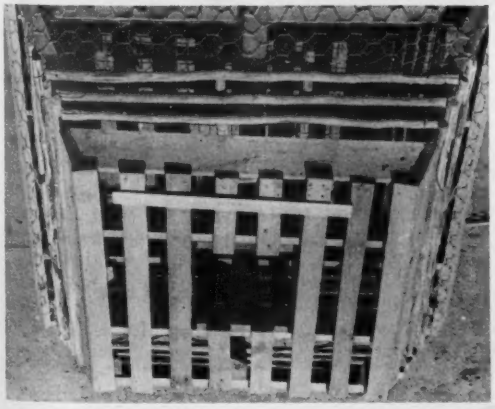


Fig. 10 - Florida-type spiny lobster fishing pot used at Camino Nuevo, Yabucoa.

Gill net (3%): common on north coast. It is a fence of fiber webbing (fig. 11) in which fish are caught (gilled) in net's meshes. Sizes of mesh depend on species and size of fish sought. Its height and length are also variable. Several types used, such as bottom and surface gill net ("trasmallo" or "filete"), and trammel net ("mallorquin").

Fig. 11 - Six hundred yards length by four yards length by four yards depth gill net used by fishermen at Puerto Real, Fajardo.

Trot line (1.4%): this type ("palangre") is a long fishing line with series of baited hooks on short, separate, branch lines (fig. 12). It can be anchored or left drifting, and requires only periodic attention.

Fig. 12 - One hundred hooks trot line gear for bottom fishing at Puerto Real, Cabo Rojo.

Spear (1%): has limited use in inshore commercial fisheries. Generally, the spear ("fisga") is used by fishermen with a diving outfit. They catch mainly lobster or big fish.

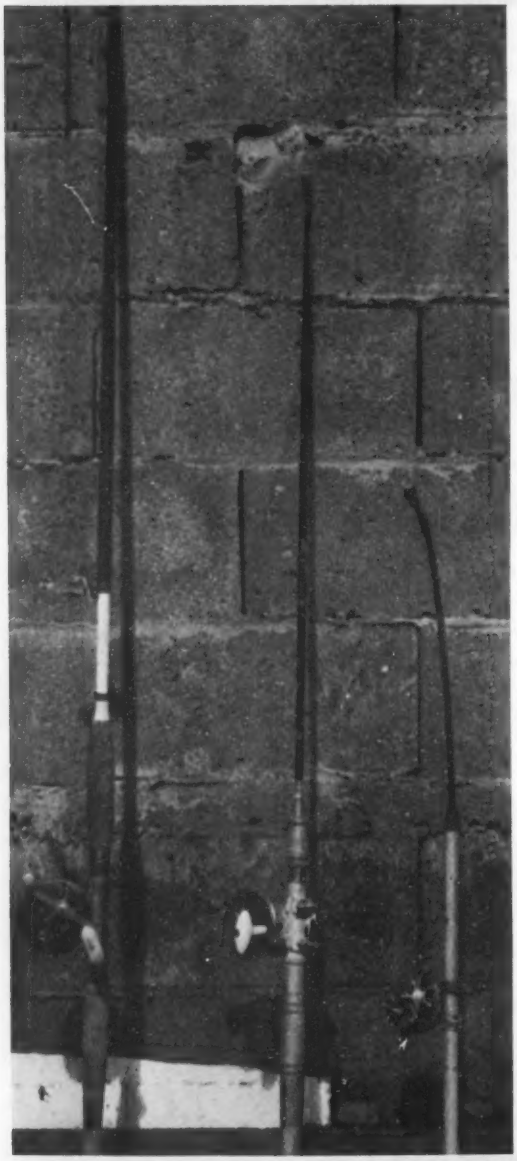


Fig. 13 - Different types of pole and lines used at La Puntilla, Cataño.

Haul seine (0.9%): an encircling type of net made of mesh webbing and with two wings and a bag. Top line has floats to keep it at surface, while bottom or foot line is weighted. Bag is flanked by wings, to which auxiliary lines are attached. A haul seine ("chinchorro") generally is set from row boat and hauled to the shore line, or to beach, by 8 to 10 auxiliary fishermen.

Pole and line (0.5%): utilized principally by sport fishermen. A few commercial fishermen use it occasionally (fig. 13).

'Others,' the hand reel (0.2%): It holds about 1,500 feet of $\frac{3}{64}$ stainless steel stranded cable; 4 to 6 circle hooks sizes 7, 8, and 9 are fished from each line. Hand reels have been reported only from Salinas and Vieques Island. Deep-water fishes--snappers and groupers--are caught with it. Sometimes a home-made imitation of conventional hand reel (fig. 14) is used.

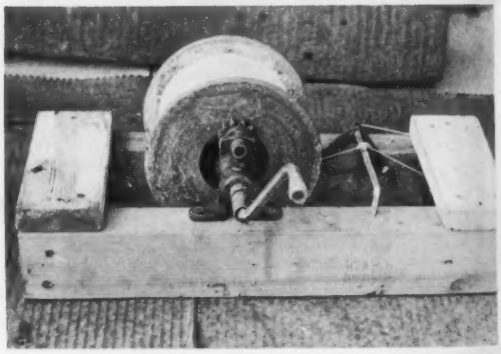
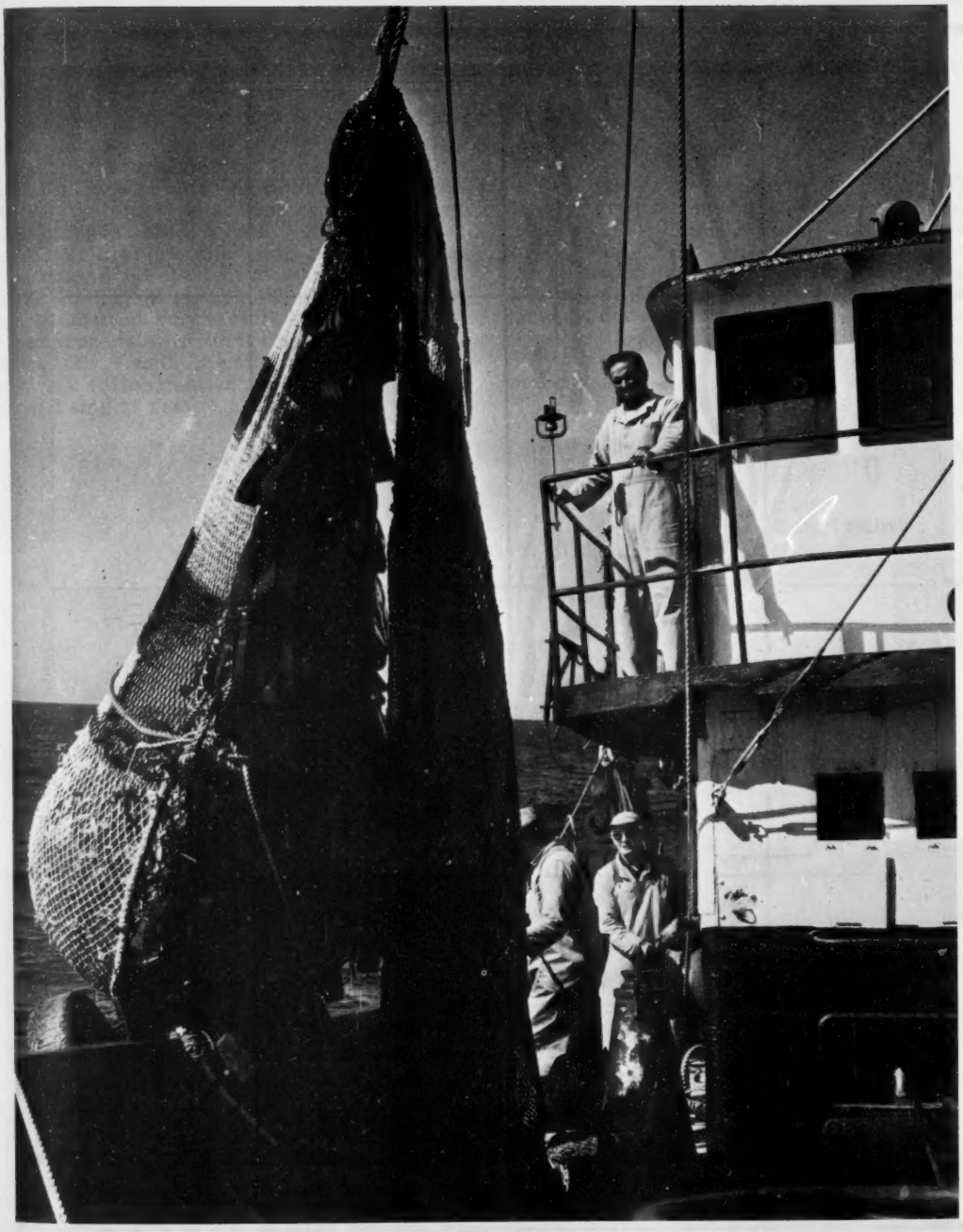


Fig. 14 - Hand made hand reel for deep fishing at La Puntilla, Cataño.

ACKNOWLEDGMENTS

I am grateful to Mr. Rolf Juhl, Coordinator of the Fisheries Development Program (PL 88-309) in Puerto Rico, who reviewed the manuscript and made useful suggestions. Also, to Mr. Félix Iñigo, Chief, Division of Fish and Wildlife, Department of Agriculture, and his staff, for access to files and for sharing his long experience in Puerto Rican fisheries. Mr. Donald S. Erdman, above Division, read manuscript and made useful observations.



Bag of fish taken during bottomfish explorations by BCF research vessel 'Oregon'. (Photo: J. B. Rivers)

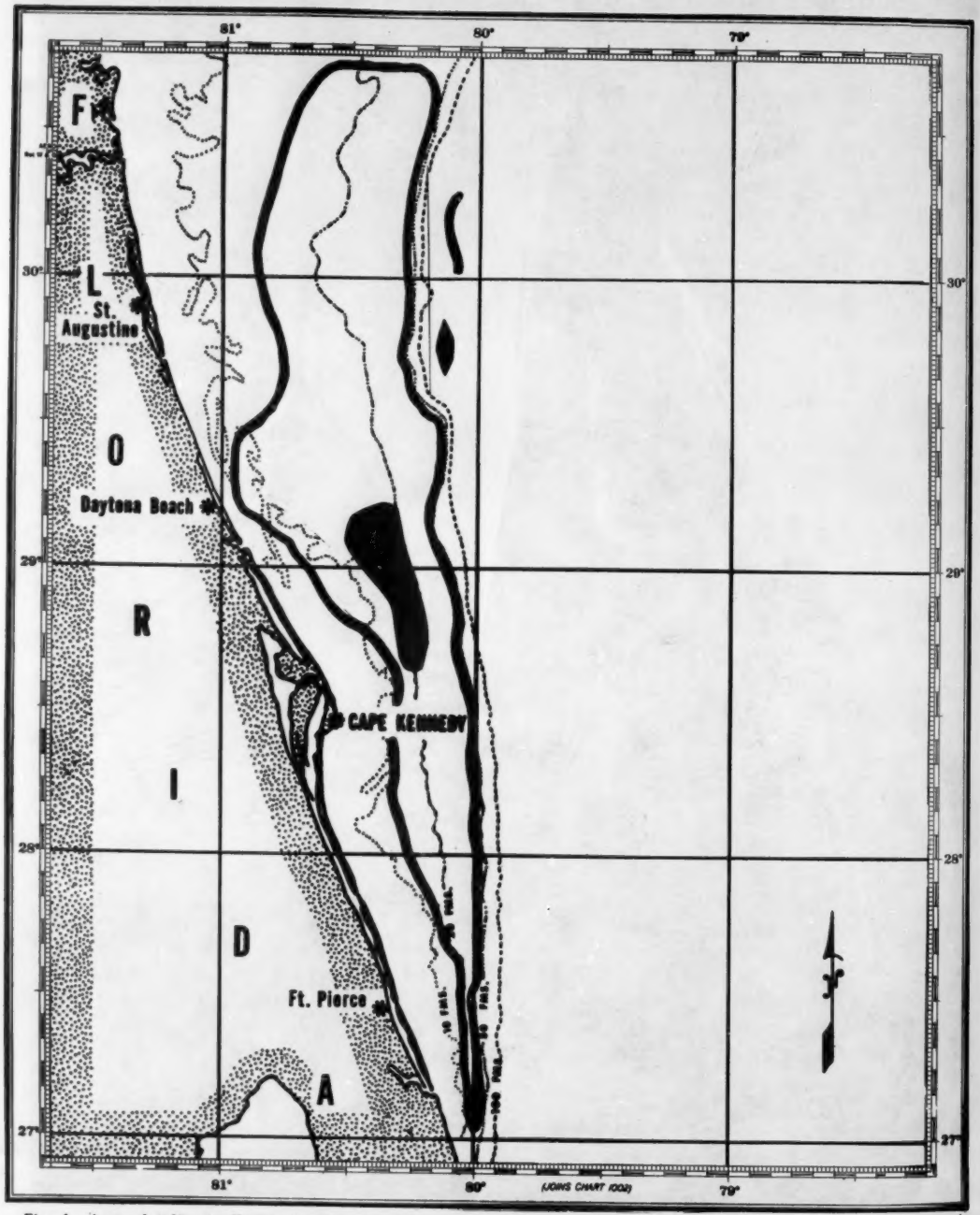


Fig. 1 - Area of calico scallop explorations by BCF research vessels 'Silver Bay' and 'Oregon,' 1960-1968, and area of major effort by commercial calico scallop fishing fleet, 1969.

CALICO SCALLOP FISHERY OF SOUTHEASTERN U. S.

A Photo Review of Latest Developments

Robert Cummins Jr. and Joaquim B. Rivers

Numerous sporadic attempts to develop automated processing equipment for calico scallops have culminated in the construction of four factory-type scallop vessels. These are equipped with processing machinery that automatically sorts the catch and shucks and eviscerates live scallops at sea. The vessels began fishing in early 1969. The equipment had been used successfully only for shore-based processing in North Carolina, so initial operations consisted primarily of modification and refinement of the system for use aboard ship at sea.

Cape Kennedy Grounds

The vessels have operated on the Cape Kennedy grounds out of the Florida east coast ports of Ft. Pierce, Port Canaveral, and St. Augustine (Fig. 1). The largest of the four vessels, 'Kon Tiki No. 1', recently was diverted to fishing in Central America because of domestic labor problems. The other vessels, 'Ruth M', (Fig. 2), 'Sheela L.', and 'Venture', have been operating with variable successes.

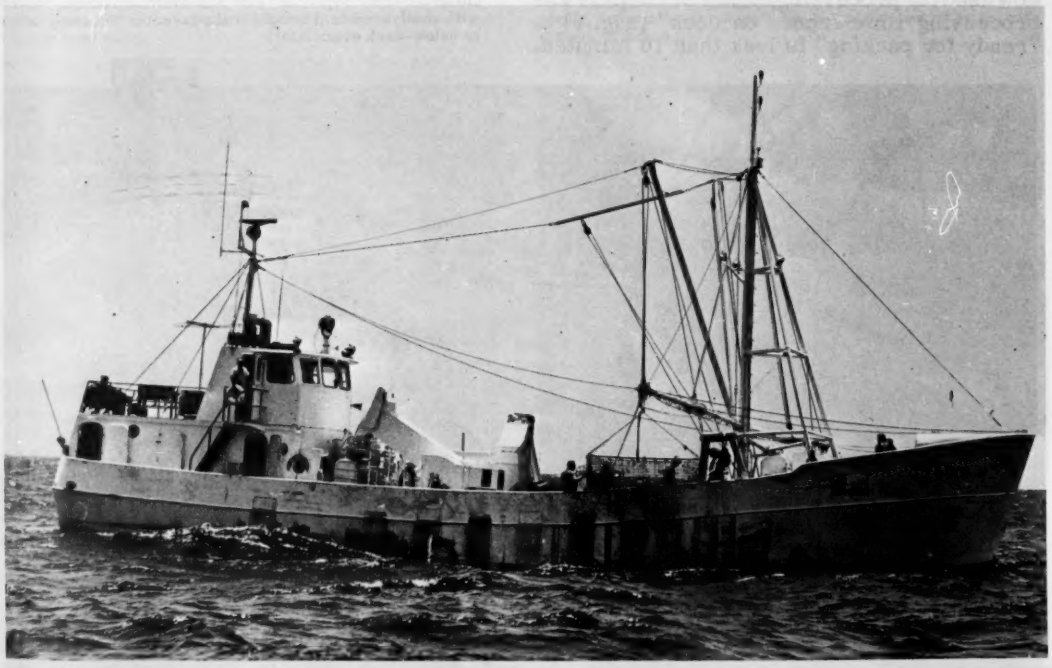


Fig. 2 - Factory scalloper Ruth M., 86-foot steel hull, fully automated to process calico scallops at sea, operating on Cape Kennedy grounds.

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By September 1969, production rates had gradually increased to a maximum of about 4,000 pounds of processed scallop meats per 24 hours of fishing. Increased production at that time was limited by the processing equipment rather than the catch rate. During the period, wholesale prices for scallop meats averaged $1.50 per pound. The vessels are "ice" boats that land the processed scallop meats in 10-pound containers packed in ice; about 12,000 pounds are their maximum holding capacity. When landed, the meats are frozen in liquid nitrogen or sold as "fresh."

Under 10-Minute Processing

Although equipment modifications continue to be made, the accompanying photographs by Joaquim B. Rivers show the equipment now used for processing calico scallops. The processing time from "on deck" (Fig. 3) to "ready for packing" is less than 10 minutes.

Fig. 3 - A 10-foot "tumbler dredge" with about 1,400 pounds of calico scallops coming aboard after 15-minute drag.

Five sequential processing steps are shown: 1) sorting the catch (Figs. 4, 5, 6, and 7); 2) shucking (Figs. 8 and 9); 3) cleaning (Figs. 10 and 11); 4) eviscerating (Figs. 12, 13, and 14); and 5) chilling/packing (Figs. 15 and 16).

Fig. 4 - Overall view of main deck processing equipment. Includes conveyor "separator" with trash overboard trough, "shucker" with shell overboard trough, and salt-water "cleaning trough" to below-deck eviscerator.

Fig. 5 - Feeding the bucket conveyor leading to "separator."

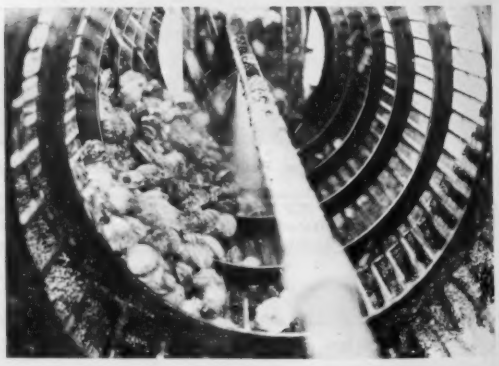

Fig. 6 - Inside view of rotating screw-type squirrel cage "separator."

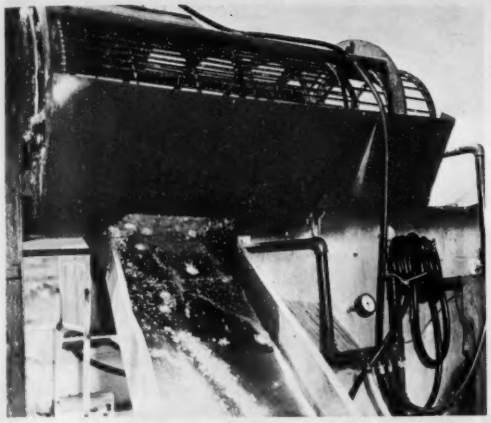

Fig. 7 - Side view of "separator" with trough where dead shell and debris go overboard.

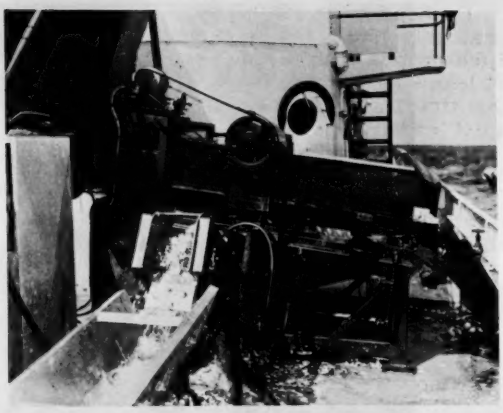

Fig. 8 - Shaker screen or exit portion of "shucker" where shucked meats and shells are separated. Shown are overboard trough for shells, and salt-water cleaning trough for shucked meats with viscera attached.

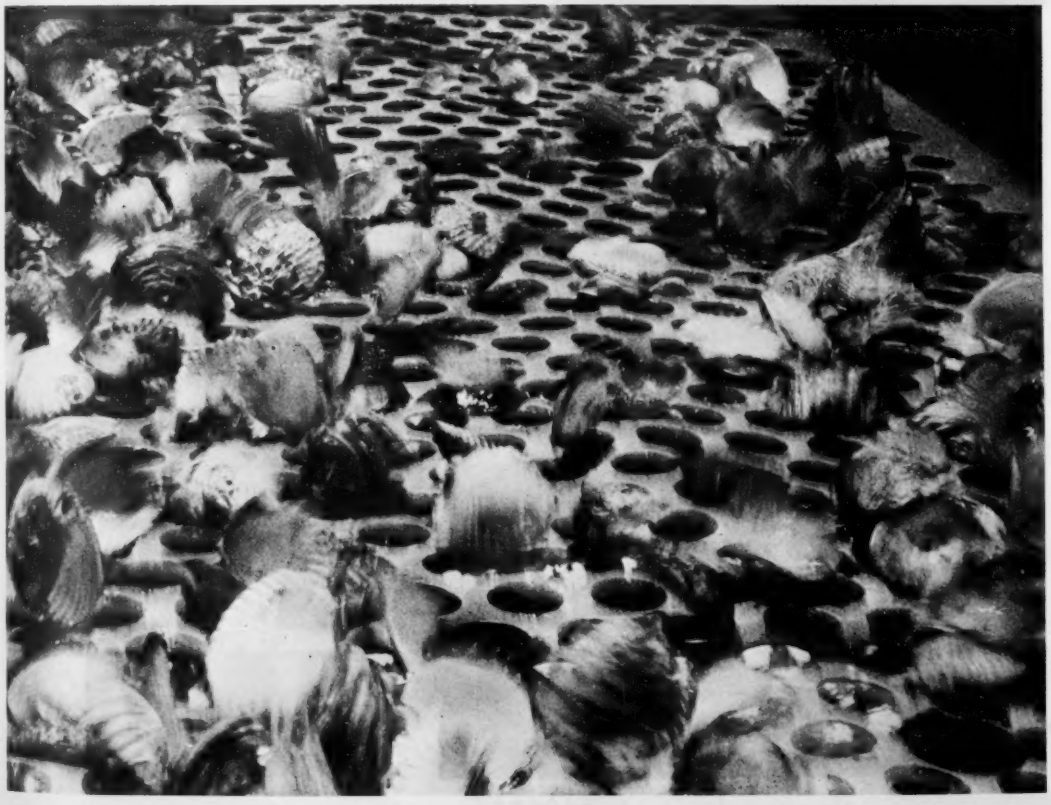

Fig. 9 - Vibrating shaker screen separating shells from shucked scallop meats. The meats drop through perforations in the screen.

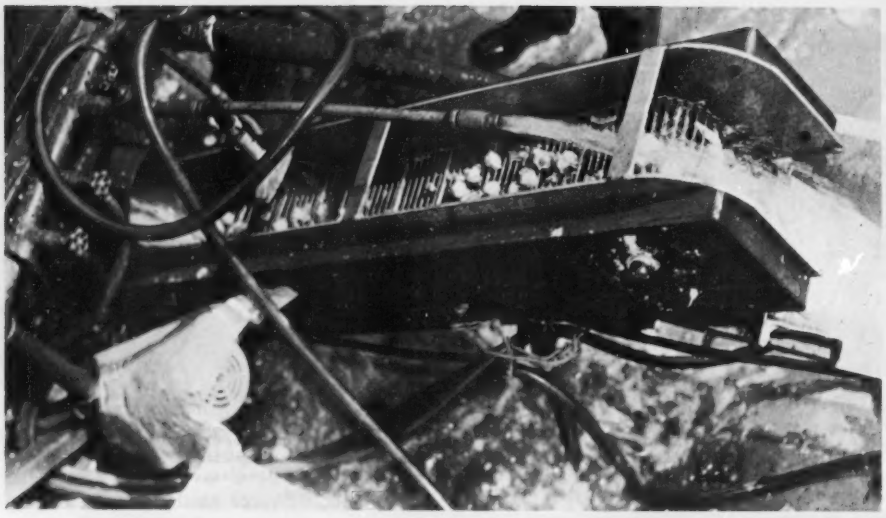

Fig. 10 - "Hamburger machine," a washer conveyor for shucked meats between shaker screen and salt-water floatation cleaning trough.

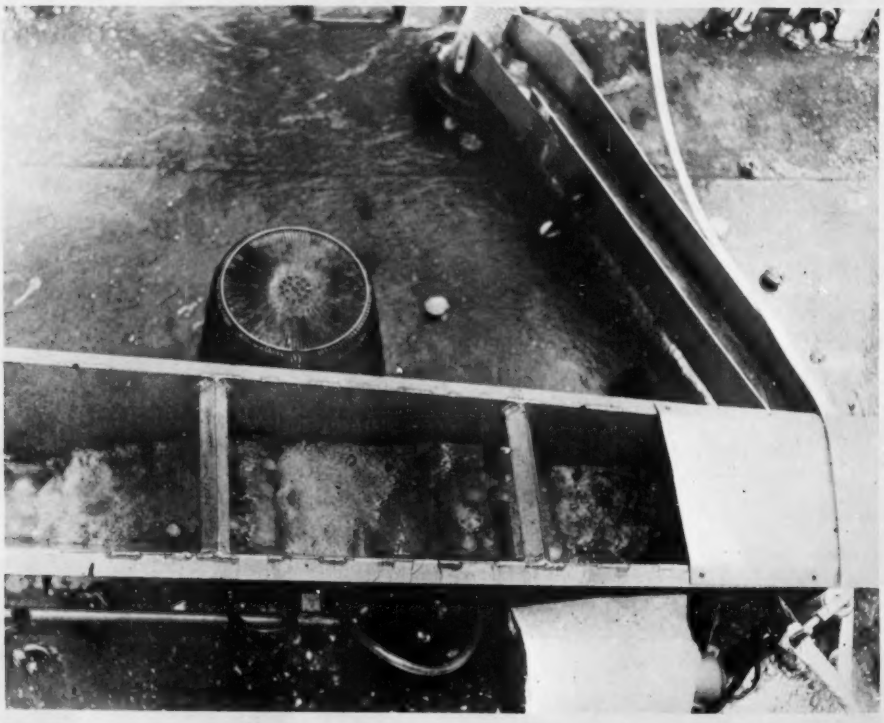

Fig. 11 - Salt-water floatation cleaning trough and conveyor trough leading to below-deck eviscerator.

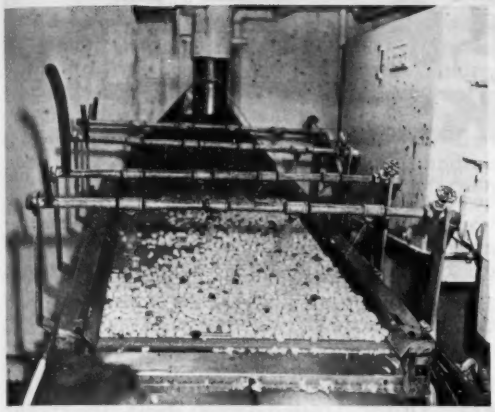

Fig. 12 - Rotating roller-type "eviscerator," below deck, separates viscera from edible adductor muscle.

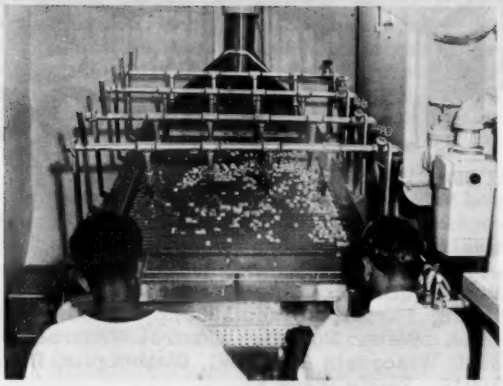

Fig. 13 - Inspecting eviscerated scallop meats coming off "eviscerator" prior to brine chilling.

Fig. 14 - Freshly eviscerated calico scallop meats.

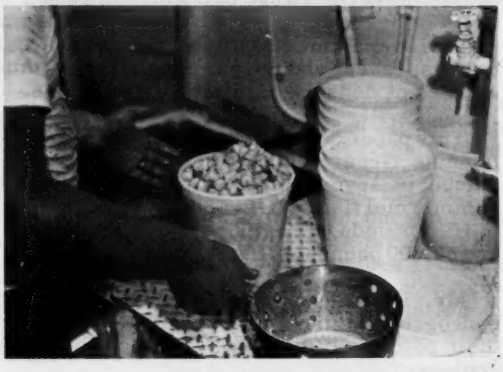

Fig. 15 - Packing brine-chilled scallop meats in 10-pound plastic buckets.

Fig. 16 - Ten-pound buckets of processed scallop meats packed in ice.

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EUTROPHICATION

"Pollution and Eutrophication Problems of Great South Bay, Long Island, New York," by Jack Foehrenbach, article, 'Journal of the Water Pollution Control Federation,' Vol. 41, No. 8, Part 1, August 1969, pp. 1456-1466, illus. Water Pollution Control Federation, 3900 Wisconsin Ave. NW., Washington, D.C. 20016. Single issue $2.

The population increase is causing serious problems of pollution and eutrophication in many of our natural waterways. Homes and high-rise apartments built on the banks of estuaries, lakes, and streams tend to become centers of densely populated urban areas.

This paper describes the problems of Long Island's Great South Bay--a body of water unique in several ways. One is its valuable commercial fishery. In 1966, it yielded 4,792 million pounds of shellfish worth $4,250,000, and 53,400 pounds of finfish valued at $12,000.

Mr. Foehrenbach discusses the bay, its hydrography, the sources of pollution and their potentially adverse effects on the bay's ecology.

FISH-KILLS

"A Kinetic Model of Fish Toxicity Threshold," by Car W. Chen and Robert E. Selleck, article, 'Journal of the Water Pollution Control Federation,' Vol. 41, No. 8, Part 2, pp. R294-R308, illus., $2.

Hundreds of fish-kills resulting from the discharge of toxic waste waters into natural waterways are reported in the U.S. every year. Criteria governing discharge regulations are based on 'threshold concentrations' of toxic substances. Threshold concentration usually is defined as the lowest toxicant concentration that can kill a fish.

This article describes a method that can be used to determine the threshold concentrations of various mixtures of toxicants--and to evaluate the proportional amounts of toxicity contributed by individual components.

FISHERY LITERATURE

"Commercial Fisheries Abstracts, Author Index 1954-1969," edited by Frances Spigai, $15. Order from Oregon State University Computer Center, Corvallis, Oregon 97331.

Over 24,000 author entries cover 16 years of articles in Commercial Fisheries Abstracts. The index is presented in a simple format, including author, date, page, code and subject for each entry.

PROCESSING

"Freezes Catfish with Liquid Nitrogen," article, 'Food Engineering,' Vol. 41, No. 12, Dec. 1969, pp. 66-7, illus. Food Engineering, Chilton Co., Chestnut and 56th Sts., Philadelphia, Pa. 19139. Single copy $1.

Mississippi catfish processor states that using a conventional air-blast freezer, it takes 12-18 hours to process and freeze his product and shrinkage loss is 3-5%. This article describes a liquid-nitrogen freezing unit that reportedly can do the job in less than 15 minutes--3½ for processing and 10 for freezing--with no loss from shrinkage. The nitrogen-frozen catfish also seemed to have better color, flavor, and texture than this processor's air-blast frozen product.

"A New Midwater Trawl for Sampling Discrete Depth Horizons," by Malcolm R. Clarke, 'Journal of the Marine Biological Association of the United Kingdom,' Vol. 69, No. 4, Nov. 1969, pp. 945-960, illus.

To study the vertical distribution of animals effectively and economically, towed

sampling devices that can be opened and closed are essential. To be effective, such gear must: catch the size range of animals selected for study; have an opening-closing mechanism that retains the catch made at a chosen level; and sample at no other levels--or keep such samples separate. The gear also must have a depth-metering device, and be able to register the period and/or depth when the net is open.

Mr. Clarke describes a new trawl designed to these specifications. He details its opening and closing equipment, acoustic release gear, depth-telemetering pinger, and the method to operate the trawl from a research vessel.

RESOURCE MANAGEMENT

"Largemouth Bass and Other Fishes in Ridge Lake, Illinois, 1941-1963," by G.W. Bennett, H. Wickliffe Adkins and W.R. Childers, Illinois Natural History Survey Bulletin, Vol. 30, Article 1, Sept. 1969, 67 pp., illus. Illinois Natural History Survey, Natural Resources Building, Urbana, Illinois 61801.

The study of the management of the fishes of Ridge Lake is possibly the longest continuous investigation ever made of a warmwater fish population in a small artificial lake. The lake was drained completely and the fish population tallied nine times in 23 years.

One of the more important aspects of the long-term study is that it demonstrated the variability of a fairly simple population of common fishes, not only in numbers and total weight, but also in the yield obtainable. These variations are partly related to the application of various management techniques. They are related even more importantly to the incomplete ecosystem represented by the habitat and its plant and animal association. It is incomplete because certain components are absent. This situation is more or less the case with all artificial lakes and reservoirs, and many natural lakes.

The report examines the data on, and the effects of, the fish censuses, competition, size distribution, survival rates, mortality factors, and management techniques.

SALMON

"Growth Rate and Body Composition of Fingerling Sockeye Salmon, Oncorhynchus nerka, in Relation to Temperature and Ration Size," by J.R. Brett, J.E. Shelbourn, and C.T. Shoop, article, 'Journal of the Fisheries Research Board of Canada,' Vol. 26, No. 9, Sept. 1969, pp. 2363-2394. Queen's Printer, Ottawa, Ontario. Single issue $1.

This paper describes the materials, methods, and results of a study determining how temperature affects the growth and efficiency of food conversion of young sockeye salmon at various levels of feeding intensity. It also describes a test of the authors' hypothesis that the optimum temperature for growth would shift to a lower temperature with a decrease in ration.

SENSE OF SMELL IN FISHES

"Olfaction in Fishes," by Herman Kleerekoper, Indiana University Press, 1969, 222 pp., illus.

Dr. Kleerekoper reviews recent progress in the study of the significance of olfaction in fish behavior to acquaint the serious student with this important and fascinating area of biological research. He covers the role of olfaction in procuring food, in parental and social behavior, and in defense mechanisms and homing orientation. He includes sections on the electrophysiology of the olfactory apparatus, neural pathways, nares, cells, blood, enzymes, pigments, and circulation of water in the olfactory organ.

SHRIMP

"The Ocean Shrimp, Sergestes similis, off the Oregon Coast," by W.G. Rearcy and Carl A. Forss, 'Journal of Limnology and Oceanography,' Vol. 14, No. 5, Sept. 1969, pp. 755-765.

Sergestes similis is important in the oceanic food web. It preys on euphausiids and copepods and, in turn, is preyed upon by large carnivores such as albacore and rockfish. It is also the most abundant pelagic shrimp in modified subarctic waters off the northwest Pacific coast.

This is a study of its inshore-offshore and seasonal distribution, sexual maturity and egg size, breeding seasonality, size structure, recruitment and growth in the northeastern Pacific off Oregon.

THERMAL POLLUTION

"Biological Aspects of Thermal Pollution," Vol. I, xx + 407 pp., illus.; 'Engineering Aspects of Thermal Pollution,' Vol. II, xx + 351 pp., illus. Order from Vanderbilt University Press, Nashville, Tennessee 37203. $7.95 each volume.

Thermal pollution is usually caused by the discharge of hot condenser cooling water into the surrounding waters. Fisheries biologists, water resources managers, and others are gravely concerned by the threat it poses to water quality. Very few chemical, physical, or biological processes in water are unaffected by a temperature rise. Aquatic life responds with increased metabolic activity, lowered resistance to toxic substances, and greater need for oxygen.

Waste-heat discharges from electric power generating plants already have raised water temperatures in many U.S. streams. The national demand for electricity is growing so enormously that, by 1985, waste-heat discharge from such plants is expected to quadruple. Despite this immediate and serious threat, little is known about the facts of thermal pollution.

In summer 1968, in an attempt to determine the state of current knowledge and the most urgent research needs, the Federal Water Pollution Control Administration and Vanderbilt University cosponsored two symposia to bring together engineers, scientists, and government officials in the field. These two books are the symposia proceedings.

THE FOLLOWING PUBLICATIONS OF THE DEPARTMENT OF INTERIOR, FISH & WILDLIFE SERVICE, ARE AVAILABLE FROM DIVISION OF PUBLICATIONS, BCF, 1801 N. MOORE ST., ARLINGTON, VIRGINIA 22209.

AQUARIA

"Experimental Sea-Water Aquarium," by Reuben Lasker and Lillian Vlymen, Circular 334, Nov. 1969, 14 pp., illus.

Among other facilities at BCF's Fishery-Oceanography Center, La Jolla, Calif., is a 9,300 sq. ft. experimental sea-water aquarium. It incorporates some innovations not usually designed into other sea-water systems that make it invaluable in fishery and marine biological research. This paper describes the aquarium, the sea-water supply, temperature regulation, maintenance, environment rooms, and other special features.

MENHADEN

"Synopsis of Biological Data on the Atlantic Menhaden, Brevoortia tyrannus," by John W. Reintjes, Circular 320, Nov. 1969, 30 pp., illus.

This is a review of the taxonomy, morphology, distribution, reproduction, life history, growth, behavior, and abundance of Atlantic menhaden. Mr. Reintjes includes data on the size, age, and sex composition of the commercial catch, estimates of its relative abundance, and a description of fishing methods and equipment.

PROCESSING

"Guidelines for the Processing of Hot-Smoked Chub," by H.L. Seagran, J.T. Graikoski and J.A. Emerson, Circular 331, January 1970, 23 pp., illus.

The production of hot-smoked fish must be carried out under strict processing regimens and in a sanitary environment. Failure to observe such precautions may result in a product of inferior quality that even could be hazardous to public health.

The raw fish is processed by handling, preparing, brining, heating, and smoking. The smoking colors, flavors, and cooks the flesh. With proper processing and careful sanitation of plant and raw material, the product will be safe, wholesome and of acceptable quality. When adequately refrigerated, it will resist microbial spoilage.

This pamphlet provides descriptive guidelines for preparing hot-smoked chub. They should meet both the requirements of the regulatory agencies concerned and the economic demands of the industry. The guidelines cover plant sanitation, raw material quality (both frozen and nonfrozen stocks), processing--brining, smoking, and monitoring equipment--and packaging and handling. Charts for calculating brine strengths and a method of determining salt concentrations in fresh and smoked chub are included.

TUNA

"Review of Studies of Tuna Food in the Atlantic Ocean," by Alexander Dragovich, SSR-F No. 593, Dec. 1969, 21 pp.

A thorough knowledge of the food and feeding of tunas is requisite to an understanding of their regional and local aggregations and behavior.

Mr. Dragovich has reviewed 57 published and unpublished reports on the food of tunas in the Atlantic. Rather than summarize each paper, he has chosen to discuss the points of most interest to a fishery biologist: food organisms; tuna feeding habits; seasonal and diurnal variation in food and feeding habits; food in relation to tuna species and sizes; and tunas as collectors of marine organisms.

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The following articles are in 'Fishery Industrial Research,' Vol. 5, No. 5, Dec. 1969:

QUALITY CONTROL

"Recommendations for Improving the Quality of Vessel-Caught Groundfish," by J. Perry Lane, pp. 203-213, illus.

Newly caught fish can suffer changes, with varying degrees of rapidity, that leave them soft in texture, dull in appearance, and high in odor-producing compounds. Unfortunately, this loss of quality is both cumulative and irreversible.

The changes are primarily chemical, bacterial, and enzymatic. They cannot be stopped, but they can be slowed. Dr. Lane suggests guidelines and practices for both vessel and catch that should ensure delivery of fish as near its quality peak as possible.

SHRIMP PROCESSING

"Alaska Pink Shrimp, Pandalus borealis: Effects of Heat Treatment on Color and Machine Peelability," by Jeff Collins and Carol Kelley, pp. 181-189.

Fresh Alaska shrimp are difficult to peel on machines. To precondition them for peeling, they commonly are held on ice for at least 2 days. Holding shrimp not only increases costs, but results in lower yield because of physical damage and leaching. Quality also suffers because off-flavors and odors develop.

This paper reports on a precooking process that can be substituted for holding on ice or in refrigerated sea-water. The precook method also results in a canned product with more color and better texture than shrimp held on ice before peeling.

TUNA PURSE SEINES

"Depth-Time Sequential Analyses of the Operations of Two California Tuna Purse Seines," by Roger E. Green, pp. 191-201, illus.

Purse-seine fishermen often see tuna disappear from well-set nets for no apparent reason. Long after purse seines became the major U.S. gear for tuna fishing, the proportion of successful sets averaged only about 50-60%.

Timing of setting and pursing is very important in successful fishing, but little information is available on the depth of a purse seine at different times during setting. This paper attempts to fill the information gap with time and space analyses of 2 California tuna purse seines. Both are near the mode of the size range used by the California fleet for tropical tunas.

Thirty-two sets were made with 2 purse seines equipped with depth-time recorders and bathykymographs. The equipment provided data to prepare composite sequence analyses and underwater net profiles for 4 basic stages of the setting and pursing operations: 1) halfway through setting, 2) end of setting, 3) start of pursing, and 4) halfway through pursing.

--Barbara Lundy

INTERNATIONAL

THREE NATIONS OWN HALF WORLD'S FISHING VESSELS

Eighty-seven countries own trawlers and other fishing vessels over 100 gross tons. More than half these ships and their total tonnage are concentrated in 3 fleets: Soviet, Japanese, and Spanish. This was reported in 'Fishing News', Nov. 21, 1969.

Lloyd's Register of Shipping Statistical Tables for 1969 shows 11,535 commercial fishing vessels in world merchant fleet of 52,276. There are also 414 fish carriers and factoryships.

USSR Leader in Larger Vessels

The Soviet Union is the leading owner of the larger fishing vessels. Her fleet of trawlers and other catchers totals 2,604; 382 of these are above 2,000 tons. She owns 304 carriers and factory vessels--66 of these above 10,000 tons, and 80 between 4,000 and 10,000 tons. The Soviet larger-ship fleet aggregates 3,405,148 tons, just short of half the 87-nation total.

Japan No. 2

Japan is in second place with 2,067 trawlers and fishing vessels (719,097 tons) and 58 fish carriers and factories (169,374 tons). She has 44 fishing craft over 2,000 tons; in this category, she is not far ahead of Poland's 34 ships.

Spain has the third largest fleet--1,289 ships, 398,755 tons--but only 9 of these are above 2,000 tons. She also has one factory ship of 10,413 tons.

The United Kingdom has only 2 ships above 2,000 tons (the presently laid-up Fairtry trawlers). However, she is in fourth place with 578 fishing vessels (240,212 tons) above 100 tons.

Smaller Fleets

Then follow: France 663 (192,876 tons) fifth, Norway 623 (178,156 tons), Poland 168 (176,275 tons), West Germany 215 (161,886 tons), Canada 458 (124,134 tons), East Germany 161 (107,111 tons), Portugal 154 (105,523 tons), Italy 158 (71,617 tons), and Iceland 228 (62,310 tons).

Small Craft Important Too

Lloyd's Tables also show the extent to which some major fish-catching countries depend on smaller coastal fishing craft. Peru has a yearly harvest of around 10 million tons of anchoveta--but she is well down in the big-ship league with 294 vessels (44,643 tons) between 100 and 500 tons. South and West Africa have 100 ships (31,818 tons). The Philippines, with a catch of 750,000 tons, has 32 vessels 100 to 500 tons; and Thailand, 850,000 tons, has only 2 vessels above 100 tons. Indonesia, more than one million tons, has 4 vessels.

ICELAND HOSTS CONFERENCE ON FISH HARVESTING

Recent developments in commercial fishing technology--locating fish concentrations, purse seining, and trawling on the bottom and in midwater--will be principal topics of an international conference in Reykjavik, Iceland, May 24-30, 1970.

Dr. Leslie L. Glasgow, Assistant Secretary, U.S. Department of the Interior, said the conference is open to private individuals and representatives of companies, Federal and state agencies, and academic institutions.

Reykjavik will be the third FAO-sponsored meeting dealing with fish-harvesting technology in recent years. The first was in Hamburg in 1957, the second in London in 1963.

Advances in Technology

In recent years, much has been learned about the distribution, abundance, and movements of fish--and their reaction to fishing gear. Methods of finding and identifying fish also have improved considerably through more efficient echo sounders, sonar, and net sounding equipment. These developments have led to spectacular advances in gear and operational methods used in purse seining and trawling, and in vessel design. Purse seining and trawling, adaptable to small and large vessels, now account for two-thirds the world fish catch.

BCF Liaison

Those attending conference must pay all costs involved. U.S. residents should contact U.S. Liaison Officer: William H. Stevenson, Chief, Division of Exploratory Fishing, Bureau of Commercial Fisheries, U.S. Department of the Interior, Washington, D. C. 20240. Telephone: Area Code 202, 343-6643.

COMMON MARKET RAISES TUNA AND COD QUOTAS

The Common Market tariff quota for tuna--fresh, chilled or frozen, whole, headless or in pieces intended for processing--has been raised from 50,000 metric tons to 65,000 tons. This was done at the Dec. 8-9, 1969, meeting of the European Communities (Common Market) Council.

The Council also increased from 34,000 tons to 39,500 tons the Community tariff quota for cod, including stockfish and klippfish, whole, headless or in pieces, salted, in brine or dried. (U.S. Mission, Brussels, Dec. 15, 1969.)

JAPANESE-BRITISH TUNA-PACKING VENTURE SLATED FOR MAURITIUS

The Japanese Overseas Fisheries Co. and Bryce Bros., a British firm, are planning a joint tuna-packing venture in Port Louis, Mauritius. Mauritius Tuna Enterprise will start with about US$181,000, half from each firm.

Plant Capacity

A two-line packing plant with a yearly 300,000-case (48 7-oz. cans) production capacity is scheduled to start in March 1970. The pack will be primarily tuna-in-brine for export to the U.S., but tuna also will be packed in oil.

Supplies from Foreign Longliners

Foreign longliners working out of Port Louis will supply the raw tuna. About 50 Taiwanese, 6 Okinawan, and 15 Japanese vessels now serve the Overseas Fisheries Company. Annual landings are around 30,000 metric tons. The cans will come from Japan.

Government Backing

Mauritius has little industry other than sugar. To develop more, the Government is making loans to Bryce Bros. ('Suisancho Nippo,' Jan. 8, 1970.)

INTERNATIONAL PACIFIC HALIBUT COMMISSION SETS 1970 REGULATIONS

In January 1970, the International Pacific Halibut Commission met for the 46th time, at Prince Rupert, British Columbia. The Commission is responsible to Canada and the U.S. for developing halibut stocks to levels that will permit maximum sustainable yield. Its regulations must be based on scientific investigations.

Benefits of Management

Before regulation began in 1931, annual catch had declined to 44,000,000 pounds. Under management, halibut stocks steadily increased, and annual yield rose to record catch of 75,000,000 pounds in 1968. The yield has diminished since then. The 1969 catch was considerably below record, but its value was second highest. In British Columbia, halibut was most valuable species in 1969, worth a record C$12,000,000 exvessel, a record high.

The Commission, concerned about the resource, recommended reducing Area 2 catch limit by one million pounds to 20 million pounds, a reduction in Area 3A by one million pounds to 30 million, and Area 3B by 500,000 pounds to 3 million. The Commission also will study the desirability of licensing all vessels landing halibut.

The Commission recommended the following regulations for 1970:

1) Area 2--all convention waters south of Cape Spencer, Alaska--shall open April 25 and close when 20,000,000 pound catch limit is attained, or Oct. 15, whichever is earlier.

2) Area 3A--between Cape Spencer and Shumagin Islands--shall open on April 25 and

close when 30,000,000 pound catch limit is attained, or Oct. 15, whichever is earlier.

3) Area3B--Shumagin Islands to Atka Island, not including Bering Sea--shall open first on April 1 for 5 days, then reopen April 25, and close when catch limit of 3,000,000 pounds is attained (including poundage taken during first season of 5 days), or on Nov. 15, whichever is earlier.

4) Area 3C--west of Atka Island, not including Bering Sea--open March 17-Nov. 15.

5) Area 4A--the Bering Sea edge-Unimak Pass to Pribilofs--open for 12 days, March 22-April 4.

6) Area 4B--Fox Islands grounds, Bering Sea--open for two 12-day periods, March 22-April 4, and Sept. 1-14.

7) Area 4C--edge grounds and Bering Sea side of Aleutians between 170° W. and 175° W.--open March 17-April 11.

8) Area 4D--east of 175° W. and north of line between St. Paul Island and Cape Newenham and waters of Bering Sea west of 175° W.--open March 17-Nov. 15.

Nursery Area

The flats in southeastern Bering Sea east of Area 4A, and south of line between Pribilofs and Cape Newenham, have been declared a nursery area and are closed to all halibut fishing.

Hours

Opening hour of Areas 2, 3A, and 3B will be 1500 hours Pacific Standard Time (PST). Closing time will be 0600 PST. Areas 3C, 4A, 4B, 4C, and 4D will open and close at 1800 and 0600 hours PST.

Closure Notices

The Commission will provide 10 days' notice of closure of Area 2; 18 days' notice of closure of Area 3A; and at least 18 days' notice of closure of Area 3B.

The next annual meeting will be held at the Commission's office and laboratory in Marine Sciences No. 2, University of Washington, Seattle, Washington 98105. Mr. Haakon M. Selvar of Bainbridge Island, Wash., was elected Chairman, and Dr. William Sprules of Ottawa, Ontario, Vice Chairman for the ensuing year. (IPHC, Jan. 30, 1970.)

CANADA AND U.S. AGREE ON RECIPROCAL FISHING PRIVILEGES

Representatives of the United States and Canada met at Ottawa Feb. 10-13, 1970, and negotiated a draft agreement on reciprocal fishing privileges in certain areas off the coasts of the two nations. In recent years, each had established exclusive fishing zones. The draft agreement is subject to Governmental approval.

The Canadian Delegation was led by Dr. A.W.H. Needler, Deputy Minister of Fisheries and Forestry. Ambassador Donald L. McKernan led the U.S. Delegation. Their advisors included state, provincial, federal, and fishing industry representatives from both coasts.

The areas covered by the draft agreement include east and west coasts of Canada and the U.S. including Alaska. The species involve all commercial fisheries affecting both nations. The 2-year draft agreement applies only to commercial fisheries and to the areas named.

Fisheries of the two nations will continue much as before in the areas designated as reciprocal fishing areas: (a) Salmon trolling by Canadians will continue to be permitted only in a 3-to 12-mile area off the U.S. U.S. salmon trollers will be permitted to continue off Canada's Vancouver Island. (b) Pacific halibut fishing in each nation's reciprocal fishing area will continue. (c) Trawl fisheries conducted in each nation's reciprocal fishing area by vessels of the other nation will continue. (d) The longstanding practice of transferring herring on the east coasts of the U.S. and Canada will continue; but neither will fish herring in the other's reciprocal fishing area. (e) Fishing for any species of clam, scallop, crab, shrimp, or lobster will not be permitted in the other nation's reciprocal fishing area. (f) The initiation of a new fishery by vessels of one nation within the other's reciprocal fishing areas will require prior consultation and agreement.

Fishing regulations in the reciprocal fishing areas are to apply equally to the fishermen of both nations.

CANADA

1969 LANDINGS IN MARITIME PROVINCES WERE RECORD VALUE

Landings in Canada's Maritime Provinces--Nova Scotia, New Brunswick, and Prince Edward Island--totaled 1,233 million pounds worth a record C$76.9 million in 1969. This compared with 1,374 million pounds worth C$74 million in 1968, and 1,090 million pounds worth C$63.2 million in 1967.

Quantity Declined

The decrease in quantity from 1968 was due largely to smaller herring landings. Record quantities and values of ocean perch (redfish) and crabs were landed in 1969. The value of 1969 lobster landings was a record C$25.4 million, 33% of value of all landings. (Canadian Dept. of Fisheries and Forestry, Jan. 28, 1970.)

* * *

PREDICT IMPROVED BRITISH COLUMBIA SALMON RUN

After the very poor salmon runs in 1969, the industry is expecting better luck this year. Predictions are that 1970's total pack will be on the high side of the 1,400,000-case, 5-year average.

Canadian Salmon Pack, 1965-69[1/]

Species	1969	1968	1967	1966	1965
	(48 Lb. Cases)				
Sockeye	358,505	611,011	558,892	407,949	245,798
Spring	5,300	7,416	14,679	14,585	18,891
Steelhead	584	933	1,296	2,480	843
Blueback	2,146	10,389	7,799	21,087	21,300
Coho	55,566	177,205	138,878	260,536	273,984
Pink	153,386	669,347	650,142	951,794	287,925
Chum	46,369	270,688	94,022	160,784	65,216
Total	621,856	1,746,989	1,465,708	1,819,215	913,957

1/Includes salmon canned from U.S. imports. (British Columbia Canned Salmon Pack Bulletin, Dec. 17, 1969.)

Northern Areas

Sockeye forecasts for the north are disappointing. A run of 1,000,000 fish, and a catch of only 320,000, has been predicted for the Skeena. The Nass run, expected to be average, could provide a catch of 224,000 sockeye.

Rivers Inlet Run Small

Only 500,000 sockeye are expected in the Rivers Inlet run; all could be used on the spawning grounds. The Fisheries Department, concerned about the effect of the efficient Rivers Inlet fleet on such a small run, is considering very drastic closures. Smith Inlet also is expected to be below average.

Fraser River Outlook Good

The Fraser River is a bright spot. The International Pacific Salmon Fisheries Commission has placed total run in Convention waters at 6,300,000 sockeye, and total catch at 4,500,000 (2,250,000 each for Canada and U.S.). The Fraser does not produce significant number of pinks in even-numbered years, but prospects for pinks in the north are most encouraging.

The Fisheries Dept. expects above-average returns in all areas from Cape Caution north, including Queen Charlotte Islands. Local stocks from Johnstone Strait also are expected to be above average. Coho and chum returns should be average; chinook possibly below. ('Facts on Fish')

* * *

NEWFOUNDLAND FISH-MEAL PLANT OPENS

A $2,750,000 herring reduction plant opened in Newfoundland in late January 1970. It is a joint project of Spencer Lake and the Clyde Lake Group of fishing industries (Nfld.), and National Sea Products Ltd. (Nova Scotia).

1,000 Tons Daily

The plant can process 1,000 tons of herring a day into meal and oil. Ten to 20 seiners will supply the fish. (U.S. Consul, St. John's, Jan. 30, 1970.)

* * *

FOREIGN FLEETS CAUSE CONCERN

Canada's Fisheries Department has disclosed that 744 foreign vessels, including 111 Soviet, fished off Canada in 1959; 211 Canadian vessels fished. In 1968, 1,815 foreign vessels (553 Soviet) and 558 Canadian vessels fished.

CANADA (Contd.):

In 1968, the Soviets caught 460,000 metric tons off Canada, compared with Canada's 1,160,500 short tons.

Fisheries Minister Criticizes Soviets

The Canadian Fisheries Minister has said that, in the Atlantic, "the haddock catch has been reduced in 10 years from 100 million pounds to 20 million. . . . the Soviet trawlers zero in on a school of fish and by the time they have finished they have virtually wiped out the entire school, there is nothing left . . . Major grounds off Canada's Atlantic coast were found to be critically overfished and in 1968 many Newfoundland fishermen had their catch cut in half."

* * *

TRIES ELECTRONIC TRACKING OF SALMON

Canada is tracking salmon electronically in the Miramichi River to discover how pollution affects salmon movements. The Miramichi is one of the world's greatest salmon-producing streams.

Tags & Sonar Capsules

Forty-eight salmon have been tagged. Sonar capsules (2" long and $1\frac{1}{2}$" in diameter) also have been inserted in their stomachs. Each capsule contains an electronic package powered by 4 mercury batteries. These have a life span of 30 days and can be tracked from as far as $1\frac{1}{2}$ miles.

* * *

HIKES SALMON-LICENSE FEES

New rulings in the salmon-licensing program, including a sharp increase in category A commercial salmon-license fees, have been announced. The increases will fund a buy-back program to reduce British Columbia's salmon fleet. The regulations will go into effect April 1, 1970. Category A includes vessels producing 10,000 pounds or more of pink or chum salmon or the equivalent. Category B vessels are those producing less than 10,000 pounds.

Beginning this year, category A vessels under 10 registered tons will pay a $100 salmon license fee, and those 10 tons and over will pay $200. There will be no increase in the $10 license for category B boats. Under the new rulings, a category B salmon license will terminate in 10 years. The B boat will not have its salmon license renewed, but after that will be allowed to fish any other species.

Categories of Boats

Owners of category A vessels will be allowed to drop to B category. They can make this choice at any time, but can never move back to category A. The 10-year terminal clause applies whenever they decide. Category B boats have the same fishing privileges as 'A,' can have the same earning power, and can be sold as producing 'B' salmon fishing vessels during their life span. Category B boats cannot be replaced to bring a new boat into the fleet. Only a category A boat can be replaced.

Company Boats 12% of Total

In April 1969, company-owned boats were frozen at 800, about 12% of the total commercial salmon fleet. They will be reduced at the same rate as the fleet when the buy-back program gets underway.

Another change will allow category A vessels to retain their salmon fishing privileges even though they do not fish for salmon. But they must take out a salmon license each year. (Canadian Dept. of Fisheries and Forestry, Jan. 16, 1970.)

EUROPE

USSR

DESIGN NEW BOTTOM AND PELAGIC TRAWLS

A new 50.8-meter universal trawl that can be used for bottom and pelagic trawling was designed and manufactured aboard the factory stern trawler (BMRT) 'Novaia Era.' Its vertical opening is 17.5 meters; horizontal 17.5-18 meters; each otter board is 6.2 sq. meters.

Tested Off U.S. West Coast

In Sept. 1968, the trawl was tested for Pacific hake at 250-400 meters between 43° and 49° N. latitudes off Oregon and Washington. In Nov. 1968, off Vancouver Island, 95 hauls yielded 1,000 metric tons of hake; average haul was 10.5 tons. In Dec. 1968, Novaia Era used the trawl in the Bering Sea for bottom and pelagic trawling for herring. Total catch was 4,300 tons, average haul 10.3 tons (usually 5.1 tons with conventional trawls), with peaks of 20-40 tons. The tests proved the trawl successful at various depths and bottoms.

New Pelagic Trawl

A 50-meter pelagic trawl also has been designed for 'Natalia Kovshova' class (8,500 gross tons) fish-canning stern trawlers. The horizontal opening is 25 meters. The vertical opening is 20, 18, 17, 16, and 15 meters at trawling speeds of 4, 4.5, 5, 5.5, and 5.8 knots, respectively. The otter boards are 8 sq. meters each. The wings and the first two bag sections are 3.1 millimeter diameter synthetic fiber line. The other trawl parts are made of lighter line.

Tests

Tested for 500 hours, the trawl caught 2,000 tons, with no hang-ups. It was 30% more efficient than the 38.5-meter trawls used by 'Atlantik'-class stern trawlers. ('Rybnoe Khoziaistvo,' Nov. 1969.)

* * *

SALMON IN PONDS RAISED UNDER NEAR-NATURAL CONDITIONS

In April 1965, scientists of the Sakhalin Branch, Soviet Pacific Fisheries Research Institute (TINRO), placed 1,680,000 chum fry in a 620-square-meter pond with a maximum pond depth of 50 centimeters. Its bottom, gravel, sand, and silt, was much like the bottom of natural spawning grounds. Water flow was regulated. Benthos for feed, reproducing naturally, had increased from 960 to 4,118 units per square meter. By the end of July 1965, it prevailed over nonfeed benthos. Walleye pollock eggs were placed on underwater feeding tables 2-3 times daily. The fry's average daily weight increase was 11.3 milligrams. After 37 days, their stomachs were 3 times as full as those of chum in a conventional nursery or in Sakhalin's Iasnomorka River. ('Rybnoe Khoziaistvo,' Nov. 1969.)

* * *

SALMON BRED ON SAKHALIN

The Sakhalin salmon hatcheries have succeeded in crossbreeding Siberian and humpback salmon. The crossbreed has the Siberian's weight and taste, and the humpback's quick growth. The hybrid fry will be released in the Pacific in spring 1970.

USSR's Largest Salmon Hatchery

The Sakhalin salmon hatcheries are the USSR's largest. They produced over 600 million fry in 1969, and the hatchery directors hope for as many this year. Great amounts of Siberian and humpback eggs are air-shipped to other salmon hatcheries, particularly in the Caucasus and on the Kola Peninsula.

New Installations

A new Sakhalin laboratory has been set up to increase salmon resources. It will coordinate the activities of both existing hatcheries and ones that will be built in the next few years.

To preserve the salmon, timber floating has been stopped on all rivers with natural spawning grounds. (TASS, Jan. 4, 1970.)

* * *

RECORD SOUNDS MADE BY KING CRAB AND SALMON

Soviet scientists have succeeded in recording the sounds made by king crab and Pacific salmon. They have made experimental tape recordings in the Pacific, the Sea of Okhotsk,

USSR (Contd.):

and Kuril Lake. Salmon make sounds like a buzzer or the ticking of a clock. King crab emit crackling sounds that grow into a noise like breaking waves.

Sound recording appears most successful with non-schooling fish such as salmon, tuna, and sharks. It also is effective with crustaceans like crab and shrimp.

The scientists claim it is possible to determine the species of the fish and even its size and migration patterns through its sounds. (TASS, Jan. 4, 1970.)

* * *

COMPILE MEDICO-GEOGRAPHICAL MAP OF PACIFIC

A medico-geographical map of the Pacific has been authored by 2 Soviet scientists, Artur Keller and Innokentii Krasnoreev. (TASS, Nov. 18, 1969.) The map supplies navigators and researchers with information on diseases. It details areas inhabitated by fauna dangerous to man: sharks, snakes, poisonous fish, echinodermata, jellyfish, etc.

TASS claims that it is the world's first medico-geographical map of the Pacific. It reflects the Soviets' increasing concern with the Pacific where their fisheries are expanding continuously.

* * *

SOVIET-BLOC COUNTRIES DISCUSS FISHERY PROBLEMS

COMECON (also known as CEMA or Council for Economic Mutual Assistance) countries met in Leningrad in early Nov. 1969 to discuss the Tri-Partite Agreement (USSR, Poland, and East Germany) on cooperation in Marine Fishing. The agreement was signed on June 28, 1962; Bulgaria and Romania joined later.

Bulgaria & Romania Progress

In 1969, the Joint Commission noted that Bulgaria and Romania had achieved considerable success in diversifying their coastal fisheries into high-seas operations. This was made possible by joint studies of fish stocks in potential fishing areas, a coordinated plan to deploy research vessels, and exchange of information. One practical result of joint research is an "electric trawl which increases catches by 40 percent." The gear was designed by Poles, Soviets, and East Germans.

What They Discussed

The delegates of 5 countries discussed increasing their cooperation, unifying their "scientific potential" (for marine research), and relations with "other international fishery bodies."

The Commission's next (8th) annual meeting will be held in Rostock, East Germany, Sept. 21, 1970.

* * *

FAR EASTERN FISHERMEN PROTEST INEFFICIENT ADMINISTRATION

On November 20, 1969, the leading Soviet newspaper, 'Izvestiia,' printed unusual 'letters to the editor' from Far Eastern fishermen. They complained of the lack of refrigerated fish carriers, insufficient moorage in Vladivostok and Nakhodka, and poor at-sea servicing for factory stern trawlers (BMRTs).

Refrigerated Carriers Lacking

The writers claimed that 20-25 BMRTs of Kamchatka's High Seas Fishery Administration were idle a total of 394 days in 1968, and 390 in first 8 months 1969, while waiting to transfer catches to carriers. This represented a catch loss of 18,000 metric tons, or about 23 tons a day.

Kamchatka's Trawler and Refrigerator Fleet vessels were idle for 1,500 days in 19 months (Jan. 1968-July 1969) for the same reason. They could have caught and delivered 10,000 tons of fish in this time. The combined loss was equivalent to about 4% of Kamchatka's total annual catch.

Excessive Demurrage

There is a striking imbalance between the fleet's fishing and processing, and carrying capacity. Fishing vessels are demurred for weeks waiting for fish carriers to unload. The carriers, in turn, may have waited weeks, or even months, to unload in port. Demurrage time of all Kamchatka's fishing fleets amounted to 72.2% of their total operating

USSR (Contd.):

time in 1967, 69.1% in 1968, and 73.1% in first-half 1969.

One letter accused the Soviet Far Eastern Fisheries Administration (DAL'RYBA) of operating Nakhodka and Vladivostok fishing harbors inefficiently. Some vessels have had to wait 40-60 days in the roadstead before mooring in port. The 'Donbass' class vessel 'Kadievka' was demurred 67 days in 9 months because of this. Demurrage of a 'Pervomaiski' or 'Donbass' class vessel costs 2,000 rubles (US$2,200) a day.

Poor Servicing At Sea

Another letter complained of disorganized at-sea servicing of BMRTs. In summer 1969, the 'Khingan' ('Maiakovskii' class) lost 5 days in June, 6 in July, and 10 in August waiting for refrigerated carriers to transship her catch. She could have caught 700 tons of fish and produced 500,000 rubles (US$550,000) worth of fishery products in that time. The Khingan fished off Hawaii in August 1969. (U.S. Embassy, Moscow, Nov. 22, 1969.)

The First Deputy Minister of Fisheries admitted late Jan. 1970 in 'Pravda' that the protests were justified. He said the following measures would be taken to improve the situation: (a) equip the entire Soviet fishing fleet in 1970 with lighter large-mesh trawls permitting 20% increase in towing speed and 10-15% in catches; (b) attach one mothership to a group of fishing vessels to streamline fishing and catch-transfer operations (experiments successfully conducted in N. Atlantic with 'Trudovaia Slava' and fleet of 37 fishing vessels); (c) construct improved factory stern trawlers with mechanized production lines. (U.S. Embassy, Moscow, Jan. 24, 1970.)

* * *

STAGE TV FILM FESTIVAL ON FISHING & FISHERMEN

In September 1969, the 4th TV Film Festival on seamen and fishermen was held in Riga, Latvia. East Germany, Czechoslovakia, Poland, Bulgaria, Finland, and USSR entered films dealing with the life, labor, and adventures of seamen and fishermen.

Czech Film Wins

The first prize went to a Czech film, second to a Finnish film, and third prize was awarded to a Soviet film on tuna fishing in the Atlantic. A Polish TV film on a Polish journalist (Leonid Telig) who sailed around the world on a sailing yacht received a citation. ('Rybnoe Khoziaistvo,' Dec. 1969.)

* * *

SCIENTISTS STUDY LUMINESCENCE OF MARINE ANIMALS

Bioluminescence studies in the Soviet Union are described by biologist A. Kovalev in an article translated by the Novosti Press Agency.

Many marine animals, including fish, possess luminescence. Sometimes its intensity is so great that one can read a newspaper near a glass jar containing 5-6 euphausiidae crawfishes (krill) about 27 millimeters long. Oceanographers in bathyscaphes and bathyspheres deeper than a kilometer photographed some fish and other animals without using spotlights.

When & Where Organisms Shine

Most marine surface organisms do not shine in calm weather. They produce a flare only when irritated mechanically. So along a ship's side--or in wake-stream with very high concentration of shining organisms--a light strip appears that often disappears just a few dozen meters behind ship's stern.

What is biochemistry of live light? Luciferin and luciferase were found in the special organs of many shining organisms. With aid of luciferase, oxygen oxidizes luciferin; the reaction is attended by luminescence and secretion of very little heat. Bioluminescence interests scientists because they can't obtain light without a great expenditure of heat.

The commercial fish of the oceans' surface layers do not shine themselves. But they concentrate and move quickly--and cause small organisms to shine. This allows fishermen to locate shoals.

Research at Sevastopol

Soviet scientists have turned from describing bioluminescence to studying it quantitatively. The Sevastopol Institute of the Biology

USSR (Contd.):

of Southern Seas, using photoelectronic equipment, showed that the shining intensity of Black Sea noctiluca varies seasonally. Maximum intensity occurs in June and October. The Institute also measured the intensity of luminescence in the Mediterranean and the north Atlantic.

One scientist hypothesizes why fish concentrate around light sources. He assumes that in the process of evolution, they have developed a positive reaction to the bioluminescent field. The reaction appears when they move and is caused by excitation of small, shining, plankton animals.

When catching fish using light, the lamps immersed into water to attract fish must conform to spectral characteristics of the bioluminscent field.

UNITED KINGDOM

MOVES TOWARDS SMALL STERN TRAWLERS

The British deep-sea trawling industry now widely accepts the stern trawler for distant-water fishing. However, this attitude has not extended to vessels under 140 ft. In the near-water fleet--189 vessels 80 to 110 ft.--there were no stern trawlers at the end of 1968; there were only 3 in the 177-vessel middle-water fleet.

New Stern Trawler

But there have been recent signs of a change in attitude. A Hull-based firm will try a prototype 82½ ft. stern trawler. It will operate from Fleetwood on the west coast.

Boston Fleet

Boston Deep Sea Fisheries Ltd. has announced a more ambitious project. The firm, Britain's second largest trawler group, has vessels based at Hull, Grimsby, Fleetwood, and Lowestoft. The Boston fleet is like other vessels working in the North Sea from the Suffolk port of Lowestoft. It consists of 100-120 ft. diesel-powered side trawlers. The Lowestoft industry has long believed that stern fishing is not suited to North Sea conditions. Some efficient new vessels have been built for Lowestoft in recent years, all side trawlers.

Protoype for Boston Fleet

Now the Boston group has concluded that the time has come to introduce a stern trawler to the port. The vessel, about 100 ft. long, incorporates many interesting new features. It may set the pattern for future trawlers in near-water fleet. It will be followed by at least 5 more. (It is believed the new trawlers will use the net drum.) ('Fishing News International,' Dec. 1969.)

FRANCE

INCREASES SUBSIDIES FOR DEEP-SEA FLEET

To encourage modernization of long-range fishing vessels, France recently announced a 15-25% increase in subsidies to owners of such vessels. The Fund for Economic and Social Development also is providing credit to owners building new vessels. Few vessels have been added to the distant-water fleet in recent years, although several trawlers for middle-water fishing have been built in Poland. One reason for the lack of new vessels is the hake scarcity on Irish and Scottish grounds. The scarcity also has sent some vessels venturing off the coasts of Iceland.

Buys Vessels From Poland

From 1952 to 1969, French companies were authorized to purchase 26 vessels from Poland. Deliveries were made to 7 different French ports, but most went to St. Malo. An order for one freezer-trawler, to be delivered in 1971, was placed with Gdynia shipyards recently. To operate in the North Atlantic, it will be the largest and best equipped in the French fleet. The vessel, homeported in St. Malo, will be 89.9 meters long overall, 1,350 gross tons, and have a 2,061 cubic meter total hold capacity.

The French fleet has about 706 vessels over 100 gross tons each, and totals 194,200 gross tons. ('Fishing News,' Jan. 9, 1970, and 'Polish Maritime News,' Oct. 1969.)

* * *

THE FRENCH TUNA INDUSTRY

David K. Sabock

Tuna canning is an old French industry. It started at La Rochelle and Les Sables d'Olonne in 1850. By 1869, the island of Croix had become the tuna center, but it wasn't until 1891 that the first major tuna-fishing campaign was organized in Concarneau.

Today, French tuna vessels fish the nearby Atlantic and Mediterranean waters--and range to the distant fisheries in the Gulf of Guinea off W. Africa, and in the Indian Ocean. Despite the fleet's wide range, the industry is oriented domestically. However, with its fleet expanding, France sees herself becoming a more important factor in the international tuna market.

A significant amount of production takes place in several African countries tied to France by cooperation agreements. The French fishing fleet is responsible for most of this production, which is processed in African canneries with large shares of French ownership.

Catch Doubled in 10 Years

Tuna landings almost doubled from 1958 to 1968: from 34,000 metric tons (live weight) to 65,600 tons. Estimated landings for 1969 are 67,000 to 70,000 tons. This increase corresponds to increased French activity off the W. African coast, a fishery France entered in 1955-56. Since then, yellowfin has become the dominant species, accounting for 49,100 tons in 1968--75% of the total catch.[1/] Albacore, formerly the main species, accounts for most of the remainder. Albacore catches were steady from 1958 to 1964, but then declined 30% to 14,600 tons. Small amounts of bluefin, skipjack, and bigeye also are caught. Tuna account for 8% of total fish and shellfish landings--and 12% of total value.

In the last decade, world tuna landings rose from 990,000 tons to 1.4 million tons. The French catch has increased more rapidly. France now accounts for almost 5% of the world catch, compared to 3.5% in 1958. It is now the world's 4th largest tuna harvester, behind Japan, the U.S., and Taiwan.

Some confusion exists over the French names for tuna. The French equivalents of English names are given here in parentheses: Albacore (Thon blanc, Germon), bluefin (Thon rouge), and yellowfin (Thon albacore). In English translations, albacore may also be called white tuna; bluefin, red tuna.

Fishing in European & W. African Waters

Albacore and bluefin are caught almost exclusively in European waters including the Mediterranean. Yellowfin, bigeye and skipjack, but primarily yellowfin, are caught in W. African waters (Gulf of Guinea).

Albacore and bluefin are fished in nearby French waters from July to October by about 450 vessels berthed at nearly every important Atlantic port. Primary ports include Douarnenez, Concarneau, St. Geunole, Lorient, Les Sables d'Olone, l'Ile d'Yeu, and St. Jean de Luz. Concarneau and St. Jean de Luz are the leading ports.

Early in the African fishing season, effort is concentrated between Libreville, Gabon, and Point Noire, Congo. As a warm-water oceanographic front moves southward during that hemisphere's summer months, the yellowfin also move southward. The fishing area then spreads from Libreville to Luanda, Angola, in the fall--and from Point Noire to south of Luanda in the winter. French fishermen have fished as far north as Port Etienne in Mauritania. July to December is the peak season for the African fishery.

Search for Other Fishing Areas

The expanding industry has looked elsewhere for tuna. In 1968, 20 vessels explored in the Mediterranean's Gulf of Genoa. Results were satisfactory. Vessels sailed from Port-Vendres, Agde, Marseilles, and other southern ports. Observations indicated two migrations of tuna, one in spring and one in summer.

In July 1969, the French CIAP Corporation placed a US$556,000 order with a Japanese fish net and gear manufacturer for a

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1/Landings data for yellowfin include small amounts of skipjack and bigeye.

modern 400-GRT double-deck longliner. The vessel will work in the Indian Ocean from the tuna base at Reunion Island, a French possession about 400 miles east of Madagascar and near Japanese base at Port Louis, Mauritius.

CIAP is a semigovernment corporation established in St. Denis, Reunion. It was formed to develop a tuna base in the Indian Ocean in line with the EC (European Communities) common fishery policy of promoting tuna fisheries. Plans call for initially conducting exploratory fishing with a longliner and, eventually, increasing the fleet to 10 vessels. Catches will be delivered to tuna packers in France.

Reports circulated in 1969 that France's (and Europe's) largest tuna seiner, the 'Biscaya' (1,082 GRT), would be fishing tuna in the Eastern Pacific. More recent information indicates the ship is working W. African grounds.

Fleet Develops

Only 20 years ago, most of the fleet was sailing boats. Since then, vessels were developed for longlining and purse seining. Vessels also grew larger. Orders for 155- and 165-foot vessels have been placed within the last few years for St. Jean de Luz and Concarneau, mostly the latter. The success of large seiners off W. Africa has stirred considerable interest among French companies; more "super-seiners" similar to the Biscaya are being built or planned.

Two Fleets for African Fishery

There are two fleets operating in African waters: one supplies fresh tuna to local canneries, the other ships frozen round tuna via refrigerated carriers to France. Vessels include bait boats, seiners, and combination seiner-bait boats. Emphasis is swinging to the seiners because their catch rates have been higher.

Considering the rapid development in the Gulf of Guinea, total catches there should continue to increase over 1968's 50,000 tons (live weight). The 1969 fishery may not have fulfilled expectations.

Although the U.S., Japan, Taiwan, South Korea, Spain, Italy, and Portugal fish tuna off W. Africa, the French fleet is dominant. About 42 French vessels fished in 1969, including 31 freezers and 11 bait boats. Operations are controlled by the Societe de Vente de Thon Congele (SOVETCO), an association of vessel owners headquarted at Concarneau, with representatives at African transshipping ports.

Canned Pack Rises--45,000 Tons in 1970?

Canned tuna production increased 53% from 19,600 metric tons (product weight) in 1958 to 30,000 tons in 1968. An output (preliminary figure) of 37,500 tons was attained in 1969. A pack of 45,000 tons is forecast for 1970. Since 1958, total canned fish production rose from 57,000 tons to 92,700 tons in 1967. It fell to 83,400 tons in 1968 as output of canned sardines dropped drastically. Tuna now dominates the canned fish pack with close to 40% of total output in 1968. Sardines (28%) and mackerel (24%) represent most of the remainder.

France ranks as the world's 4th largest tuna packer, behind the U.S., Japan, and Italy. It produced 8% of the world's 1968 tuna pack.

Firms Concentrate

Output has increased with reduction in number of firms and plants in the canning industry, and an increase in productivity of existing canneries. The number of firms dropped from 159 in 1956 to about 107 now. These firms operated 207 plants in 1956, 130 now. Average production per plant is about 600 tons, but average capacity is 1,000 tons. Eighteen plants produced more than 2,000 tons, 16 between 1,000-2,000, 16 between 500-1,000, and 47 under 500.

Processing techniques vary, depending on how tuna are to be packed. An oil pack is most common, although much is canned in brine. Other ingredients are used, mainly tomato sauce.

Imports High, Exports Low

France is a net importer of canned fish. It purchased 39,000 tons in 1968, while exporting only 2,100 tons. In recent years, both imports and exports have been relatively steady. About 11,700 tons of canned tuna were imported in 1968, a 30% increase over 1967. Principal suppliers were Senegal (8,050 tons) and the Ivory Coast (1,800 tons). Preliminary 1969 data indicate a 15,000-ton import level with a proposed 20,000-ton purchase in 1970.

Fresh and frozen tuna also are imported, though fresh tuna purchases are only 90 tons, almost all from Italy. Frozen tuna imports were 2,400 tons, up 33% from the 1,800 tons shipped in 1967. Japan supplied 40% of the total.

Special Arrangements with African Countries

Most tuna imports originate from Senegal, Ivory Coast, Congo-Brazzaville, Malagasy, Cameroon, Dahomey, and Mauritania. Their association with EC gives them the right to sell duty free on the French market, but quota limitations are in force. Quotas are assigned annually, with added provision that the tuna canned must have been caught by French fishermen. About 70% of the quota is assigned to Senegal, most of the remainder to the Ivory Coast.

The domestic fleets of these African countries are improving, with resulting increases in catches. It is becoming increasingly difficult for France to absorb this expanding output. The French quota is considerably below the capacity of African canneries, output is rising, so attempts will be made to export to the U.S., Italy, and West Germany. To assist in this effort, a guaranteed minimum price system for tuna exported is being considered.

Besides quota arrangement, Senegal also controls the supply of fish to various canneries. Senegal has 4 canneries with a total annual capacity of 35,000 tons (1968/69 quota was only 12,500). The canneries--SAPAL, Conserverie du Senegal, SCAF, and SOSAP--are in the Dakar-Rufisque area. Local tuna consumption is very low.

The Ivory Coast's quota in recent years, has been assigned to one firm, the Societe des Conserveries de Cote d'Ivoire (SCODI). Its daily capacity is about 35 tons of tuna and sardines.

Consumption Rising

Although French consumption of all types of canned fish is rising, this form accounts for only 20% of total fish consumption. Canned tuna consumption has more than doubled in ten years. Much of the increase is attributable to large nationwide advertising campaigns. Consumption is widespread, except for poorest people. Most tuna is consumed as cold hors d'oeuvres. In 1970, consumption is expected to approach 47,500 tons, 32% more than in 1968. The supply will be fulfilled easily from domestic production, plus imports from Africa.

Government Control and Assistance

Financial support given to the industry is the same as that for all French fisheries. Aid is provided for shipbuilding, interest rebates are granted to induce owners to build new vessels or modernize existing units, and the Credit Maritime Mutuel makes loans to fishermen and cooperatives to promote ownership of vessels and foster cooperation in small-scale fisheries.

The Comite Interprofessionnel du Thon (Interprofessional Tuna Committee) controls the industry by establishing or assisting in establishing exvessel prices, quotas, special trade arrangements, allocating supplies, and planning and setting the length of each season. It also assists the industry by supporting exploratory fishing, technological development, marketing, and other programs.

Fixed Price Systems

Most fish sales are by auction, but tuna for canning, along with sardines and salted cod, are exceptions. Prices of tuna used in canning are fixed for a 3-year period by agreement within the trade and approved by government authorities. There is provision for amendment, if necessary. A minimum price system does not exist.

The system requires that a single price be set for each species. The Comite Interprofessionnel du Thon operates the system, which includes setting quantities and allocating supplies. Pressure to adopt this type of pricing arrangement came in the early 1960s when canners could not obtain adequate supplies of raw tuna, and fluctuating catches made the existing seasonal price system inadequate. A 3-year fixed price system was adopted in 1963.

In fixing quantities, priority is given to French production. Quotas for sales in the French market are assigned to African countries in October of each year based on their tonnage caught, and the capacity of the French market to absorb output. African production for 1970 may reach 20,000 tons, about double 1968's.

Supplies are allocated to canners based on firm orders accompanied by an irrevocable payment with a partial bank guarantee. Canners are held to prices as long as economic conditions remain unchanged during the life of the contract. There is a levy on value of catches to finance a partial price-equilibrium fund and a countrywide advertising campaign.

The Future

Two items are particularly interesting in considering the future of the French tuna industry: (1) the results of their preliminary attempts at establishing a tuna base in the Indian Ocean, and (2) plans for marketing tuna from francophile West African countries.

Increasing worldwide interest is being shown in the fisheries potential of the Indian Ocean. France is entering that tuna fishery in its early stages. Also, the capacity of the West African canneries is far above their quota for the French market, and the output is increasing yearly. Where will they attempt to market their production? To what extent? And how will ability to sell elsewhere affect their efforts in France?

Main sources for this article were reports in 'La Pêche Maritimé,' 'France Pêche,' and U. S. Embassy dispatches. A 35-entry bibliography is available on request from BCF Office of Foreign Fisheries.

WEST GERMANY

HERRING SHORTAGE GROWS

A growing shortage of herring has left the German canning industry unable to fill the strong domestic demand. German fishermen supply only about two-fifths of the canners. Foreign suppliers face the same difficulty as German fishermen--a declining herring catch from traditional fishing grounds. For the past three years, German fishermen have been increasing their herring fishery off the U.S. Atlantic Coast, especially on Georges Bank. However, they are still unable to satisfy the canners' demands. The canners are considering importing frozen herring from Canada.

They also are thinking about shifting to other types of fish.

Opportunity for U.S.

This situation has created a real opportunity for the U.S. fishing industry. If need be, the industry could exploit Georges Bank herring stocks. The German market would not be a stop-gap business. The annual sales potential for U.S. frozen herring there has been estimated at well over one million dollars.

Detailed Report Available

German importers and canners would welcome U.S. offers. (U.S. Consul, Bremen, Jan. 27, 1970.)

A detailed report, FFL-181, is available from Office of Foreign Fisheries, BCF, Department of the Interior, Washington, D. C. 20402.

NORWAY

FISH MEAL QUALITY IS UPGRADED

Installation of 4 solvent-extraction plants has greatly increased Norway's supply of upgraded fish meal. This was reported by the University of Rhode Island's Commercial Fisheries News Letter in Jan. 1970.

Solvent extraction is used to upgrade regular fish meal. Defatted Norwegian herring meal contains over 80% of highly digestible protein and has a pleasant malty flavor.

Pet Foods & Animal Feeds

Used in pet foods and animal feeds, defatted fish meal partially replaces dried skim milk as a source of high-quality protein. Commercial quantities are being exported to the U.S.

DENMARK

GREENLAND TO BUY 2 NEW TRAWLERS

Greenland's first stern trawler, 'Nuk,' began operations in mid-May 1969. She landed good catches despite technical difficulties and 3 wrecks during the summer. Experience indicated that raw material for fish fillet factories must be obtained on the banks far outside Greenland's coasts.

New Trawlers Planned

Now, funds have been set aside for 2 more trawlers to operate in 1971. The design, worked out with a Norwegian firm, calls for a 58-meter-long, 11.2-meter-wide, modern trawler with a load capacity of about 550 cubic meters. Nuk has a load capacity of 280 cubic meters, is 50 meters long, and 9.45 meters wide.

Equipment

The new trawlers will have a double trawl way, reinforced hulls, and 16-cylinder 1,960-hp. diesel engines. Reduction gear will allow a speed of about 14.5 knots. Crew's quarters will include 24 one-man cabins.

Ready in 1971

The two vessels are expected to enter Greenland fisheries in summer 1971. They will be based at Sukkertoppen and Fredericks-haab. (Regional Fisheries Attaché, Copenhagen, Jan. 5, 1970.)

* * *

THE FISHING FLEET

Denmark's fishing fleet (including Greenland and the Faroes) totals 4,634 vessels; gross registered tonnage is 156,000, and total horsepower is 571,467. About 13% are over 50 years old, and 25% less than 10. The bulk of this fleet--4,136 vessels, 106,000 gross tons--operate from Denmark proper. Of the Denmark-based fleet, 982 (24%) were built in the last 10 years. Most of the vessels are 5-50 GRT size.

Faroese Fleet

There are 274 vessels in the Faroese fleet, 31% over 50 years old, and about 100 less than 10. This fleet also 'boasts' the oldest vessel, 'Fimm Systrar,' 99 years old.

Greenland

In Greenland, no vessels are older than 50 years, and 84% of the 224 were built in the 1960s. (Reg. Fish. Att., Copenhagen, Jan. 27, 1970.)

* * *

OCEANOGRAPHY COUNCIL SEEKS $13.3 MILLION FOR RESEARCH

Denmark's National Council for Oceanography has requested $13.3 (US) million in government grants for a 10-year ocean research program. Projects in Danish, Greenlandic, and Faroese waters will include studies of fisheries, pollution, and the ocean bottom. The studies are part of an international project under UNESCO and the Ocean Decade. (Reg. Fish. Att., Copenhagen, Jan. 27, 1970.)

ICELAND

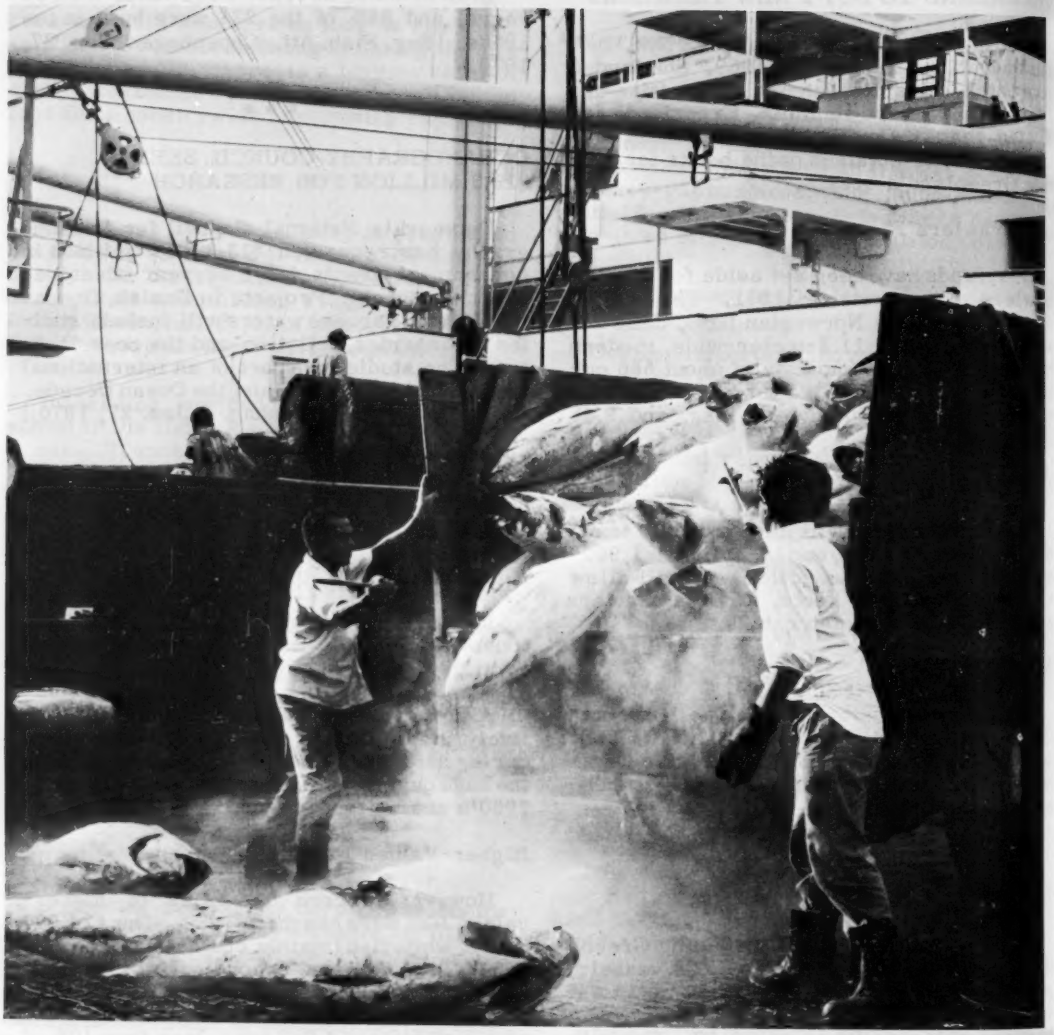
FISHERY CATCH ROSE IN 1969

Iceland's 1969 catch was 665,246 metric tons. It jumped 9% in quantity and about 15% in value over 1968.

Although better than 1968, it was a relatively small improvement over other years during the 1960s. Primarily, this was because the huge quantities of herring caught in early 1960's are no longer found near Iceland.

Higher-Valued Fish Caught

However, record quantities of higher-valued fish were caught in 1969. The 424,000 tons of white fish (mainly cod catch) exceeded 1964's 415,000-ton record. The combined catch of shrimp and lobster set a new record, slightly over 6,000 tons. The herring catch was a minimal 53,000 tons, less than 10% of the mid-60's level, but the catch of capelin was a record. The combined quantity of capelin and herring remained near 1968's 220,000 tons. (U.S. Embassy, Reykjavik, Jan. 13, 1970.)



Unloading frozen tunny in Penang, Malaysia. (Photo: ILO)

ASIA

JAPAN

U.S. CANNED TUNA MARKET SURVEYED

The Tokyo Canned Tuna Sales Company's director spent 3 weeks in January 1970 surveying the U.S. canned tuna market. He wanted to determine U.S. reaction to Japanese exports of chunk-style, light meat tuna in brine. Japanese packers would like to increase chunk-style exports because this pack uses mostly skipjack tuna.

Skipjack More Available

Skipjack are more available than other species and would considerably ease difficulties in obtaining raw material. Japan's 1969 skipjack landings were mostly small fish unsuitable for solid pack, but usable for chunk style. ('Kanzume Nippo,' Jan. 10, 1970.)

* * *

FROZEN TUNA IMPORTS INCREASE AS EXPORTS DECLINE

Japan imported 31,600 metric tons of frozen tuna, valued at about US$12 million, during Jan.-Nov. 1969, a 25% jump in quantity over same period 1968. In 1969, South Korea and Taiwan, the major suppliers, doubled their 1968 exports to Japan. The imported tuna are marketed fresh or frozen, or are used for canning. Japanese tuna imports climb yearly; in 1970 they are expected to reach 40,000-45,000 tons

Exports

Japan's exports of frozen tuna are steadily declining. Jan.-Nov. 1969 exports to the U.S. and Canada totaled 38,972 short tons valued at $16,155,203, compared with 70,854 tons worth $27,454,545 for same period 1968; exports to other countries totaled 17,262 metric tons valued at $7,107,108, compared with 29,007 tons and $11,620,650 for same period 1968.

To Change Fishing Method

The Japanese feel that present method of long-line tuna fishing cannot adequately meet the needs for exports. They feel the only solution is to increase production by using large seiners like the U.S. A joint company to operate a fleet of purse seiners belonging to different fishing firms has been proposed, but little progress has been made. There are too many differences of opinion, selection of officers, investment ratios, profit distribution, and other matters. ('Katsuo-maguro Tsushin,' Jan. 1, 1970.)

* * *

FROZEN TUNA EXPORTS TO U.S. & CANADA DROPPED IN 1969

Japan exported 42,527 short tons of frozen tuna to the U.S. and Canada in 1969, and 18,505 metric tons to European and other countries, including Mexico and Ghana--a total of about 57,000 metric tons. This was sharply below the 100,000 metric tons exported in 1968. ('Suisancho Nippo,' Jan. 12, 1970.)

* * *

U.S. EXPORTS TO ITALY CUT JAPANESE SALES

U.S. frozen-tuna exports to Italy are cutting into Japan's market. In 1969, the U.S. exported 4,650 metric tons of Atlantic-caught tuna in Sept. and Oct. alone. Japan exported 12,088 metric tons of frozen tuna to Italy in 1969 (9,989 tons Atlantic transshipments and 2,099 tons direct shipments from Japan). This is 39.3% less than the 19,893 tons delivered in 1968 and 56.9% below 1967's 28,026 tons. The decline in Japanese exports was due to sharply reduced fishing effort in the Atlantic owing to reduced profits and the transfer of vessels to other oceans to supply the domestic market in Japan where tuna consumption is rising.

Commission Sales

In order to retain their share of the Italian market, Japanese fishery and trading firms are selling tuna taken by South Korea, Taiwan, Malaysia, and Panama to Italy. In 1968, such commissioned sales probably reached 15,000 tons. In 1969, total Japanese tuna sales to Italy will be around 30,000 tons--15,000 tons from Japanese vessels including those in the Indian Ocean. The Italian market annually requires 47,000 metric tons of tuna and this means that Japan will retain barely a 63.8% share. ('Shin Suisan Shimbun Sokuho,' Jan. 7, 1970.)

* * *

JAPAN (Contd.):

ITALIANS REJECT JAPANESE FROZEN TUNA

The representative of the Japan External Trade Organization (JETRO) in Venice, Italy, reported that Italian packers are expanding production despite their complete dependence on imported raw material.

Why Tuna Rejected

He urged Japan to solve the problem of continuing Italian rejection of Japanese tuna. In 1969, he inspected about 26,752 metric tons. About 3,590 tons, 13.4%, of 29 shipments were rejected for greeness, sponginess, or orange color in the meat when cooked.

U.S. Tuna Well Received

The U.S.-supplied tuna are said to retain good quality after cooking and therefore are well received by Italian packers. ('Suisancho Nippo,' Jan. 10, 1970.)

* * *

YAIZU LANDINGS DROPPED IN 1969

In 1969, landings at Yaizu totaled 142,597 metric tons worth about US$71,971,000. Landings were down 3,844 tons from 1968, close to 3% in quantity, but up $6,790,000 (10%) in value. ('Suisancho Nippo,' Jan. 7, 1970.)

Yaizu Landings, 1968-69

Species	1969		1968	
	Quantity	Value	Quantity	Value
	Metric Ton	$1,000	Metric Ton	$1,000
Tuna:				
Bluefin[1/]	50,461	42,904	53,710	40,040
Albacore	19,139	10,165	16,295	7,876
Skipjack	45,928	14,550	48,085	12,526
Mackerel	20,166	1,803	21,341	2,284
Others	6,903	2,549	7,010	2,455
Total	142,597	71,971	146,441	65,181

1/Includes yellowfin and big-eyed tuna.

* * *

WINTER ALBACORE FISHERY WAS GOOD, PRICES HIGH

In January 1969, Japanese pole-and-line fishermen were taking large, good-quality, winter albacore off the home islands. Ex-vessel prices were as high as US$541 a short ton, the same price as ship-frozen albacore bought by cold-storage operators for export. Japanese packers could not buy much at that price. To operate profitably, they could pay no more than about $504 a short ton. ('Shin Suisan Shimbun Sokuho,' Jan. 13, 1970.)

* * *

TRAWL OFF U.S. EAST COAST

Fourteen Japanese trawlers belonging to 5 owners fished squid off the U.S. east coast near New York in January 1970. The 2,500-gross-ton trawlers were landing 17-18 metric tons a day when fishing was good. Most catches were exported to Italy, France, Spain, and Greece; some were shipped to Japan. The export price averaged US$550 a metric ton, cost, insurance, and freight (c.i.f.).

Butterfish in March & April

In March and April, the trawlers were scheduled to concentrate on butterfish and smelt. However, seas off New York became rough in March and hampered operations. Another problem is that fish with high fat content are preferred and bring a better price, but butterfish are small and lean in March.

* * *

LIVE SEA BREAM SHIPPED BY AIR

The Nagasaki Prefectural Fishery Public Corporation started air-shipping live cultured sea bream from Kyushu, southern Japan, in December 1969, to Tokyo-Yokohama area, where they are very popular in 'sashimi' (sliced raw fish) restaurants.

They are shipped in a specially built tank with a holding capacity of 170-180 kilograms (374-396 pounds), or about 200 fish. They are sold for about US$1.52 at Kyushu, and about $3.16-3.79 at the Tokyo Wholesale Market. Air transport costs about 57 cents a pound.

Vessel Shipments

The corporation previously had made 2 shipments by vessel. This method enables delivery of large quantities at low freight cost, but it also produces high fish losses and higher storage costs after unloading. While air freight is more expensive, shipments can be adjusted to consumer requirements, and very little die-off occurs in transit. Three fish died in the first air shipment; only one in the third. ('Suisan Keizai Shimbun,' Jan. 7, 1970.)

NORTH KOREA

FISHING INDUSTRY EXPANDS

North Korea has launched a new 3,500-gross-ton refrigerated fish carrier, according to a report in the 'Pyongyang Times.' The 'Daebosan' is the sistership of one completed in 1968. Designed to process and freeze fish, she also will serve as a mothership to repair and replenish the growing North Korean catcher fleet.

Fleet Modernization Successful

Fishing industry modernization, started 12 years ago, is apparently successful. In the first year, fish landings rose 7.5 times; by 1959 they were up 12 times.

Government Aid

The trend is continuing due to substantial government expenditures on building and educational programs. Construction of a large, new fishing port on the west coast was begun in 1957. This was followed by an attempt to motorize existing fishing vessels--most of them primitive and small. Ten modern trawlers were added. Fishermen also were encouraged to exploit distant waters, and to fish throughout the year, regardless of season. ('Fishing News International,' Oct. 1969.)

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Comment by Milan Kravanja, BCF Office of Foreign Fisheries: Catch data reported are obviously incorrect. According to FAO statistical yearbooks, North Koreans caught in 1953 only about 122,000 metric tons. This was less than one-eighth of 1938 fishery landings. The decline was caused by disappearance of sardines, and ravages of World War II (1941-1945) and Korean War (1950-1953). Considerable progress was made in immediate postwar years. By 1954, North Korea landed 315,000 metric tons of fish and shellfish. Mismanagement and unfavorable natural conditions reduced this figure to 291,000 tons by 1957. After "modernization drive" began in 1957, the North Koreans discontinued reporting their fishery catches.

Had such catches increased in 1959 by 12 times, as Pyongyang Times claimed, over those of "the first year of the project" (1957), the North Koreans would have landed in 1959 about 3.5 million metric tons of fish and shellfish. Had this trend "continued to date," North Korea would have become the world's largest fishing nation several years ago.

Instead, available information indicates that North Korean catches in recent years barely exceeded 600,000 metric tons. This was considerably below the 1969 record catch of 860,000 tons landed by fishermen of the Republic of Korea (S. Korea).

SOUTH KOREA

SALMON EXPORTS TO JAPAN ROSE IN 1969

The Republic of Korea (South Korea) exported about 324 metric tons of Pacific salmon to Japan in 1969. About 310 tons, mostly red salmon caught in Bristol Bay, off Alaska, were exported in August and September.

According to the Japan Tariff Association, salmon were exported (probably gilled and gutted) either fresh, chilled, or frozen. Some may have been exported after processing (salting), but such figures are not available from customs records.

Salmon exported in the early months of each year probably were caught off Korean coast. (U.S. Reg. Fish. Attaché, Tokyo, Jan. 27, 1970.)

INDONESIA

SUSPENDS FOREIGN INVESTMENTS IN SHRIMP FISHING

Indonesia has suspended further foreign investments in her shrimp fishery. On Nov. 20, 1969, the Minister of Agriculture said the action was necessary to survey effect of fishing by foreign companies on efforts to build up the shrimp beds, and on native shrimp fishing. He exempted domestic shrimp fishing and 7 foreign firms that previously had received permission to survey and fish shrimp.

Survey To Be Made

The Director-General of Fishing explained that the shrimp resources have never been surveyed--nor is the effect of present shrimping known. A survey is required before any increase in foreign activities could be allowed. He said no restrictions on other types of fishing are being considered.

INDONESIA (Contd.):

Data Collection

The Director-General also explained that a survey report will be compiled from data collected by the seven foreign companies (and Indonesian officials working aboard the companies' boats), the UNDP, and by his own staff.

The survey will last until end of 1971. The Directorate General then will be able to make recommendations regarding further foreign investments. He said most survey data probably would be made public. (U.S. Embassy, Djakarta, Jan. 7, 1970.)

TAIWAN

LEASES JAPANESE PURSE SEINERS

The recently formed Tayu Fishing Co. of Taiwan has employed a team of Japanese fishery technicians to work in Taiwan. It also has obtained a 1-year lease of 7 large purse-seine fleets from Okura Fishing Co., Japan.

Operations will be based at Keelung, Suao, and Kaohsiung ports. ('China Aquatic Products')

* * *

NEW PROFIT-SHARING PLAN SUGGESTED

The Taiwan Fisheries Bureau has suggested to the Kaohsiung Municipal Fishermen's Association new standards for profit-sharing on deep-sea tuna longliners.

Its suggestions include:

1) The balance from total sales of the catch, minus direct costs and a 10% management overhead, be shared equally by management and labor.

2) A guaranteed minimum salary of NT$1,500 (US$37.50) a month.

3) A foreign-base subsidy for vessels 50 tons and over: US$30 in Pacific and Indian Oceans; US$40 in Atlantic.

4) Life insurance: NT$50,000 (US$1,250) for each crew member; NT$100,000 (US$2,500) for each apprentice-crewman. Payment of premiums are to be considered a direct cost. ('China Aquatic Products')

SOUTH PACIFIC

AUSTRALIA

ITALY TO FINANCE AUSTRALIAN TUNA INDUSTRY

Western Australia may have an Italian-financed tuna fishing industry in 1970. Two vessels, and up to 200 men, would start operations from Onslow, Broome, or Port Hedland. Vessels would be supplied by Italy and manned by Australians. The tuna would be frozen for processing at a modern cannery at Bari, Italy.

The joint venture follows months of negotiations between the Italian government-controlled organization, E.F.I.M., and the Australian Fremantle Fishermen's Cooperation Society Ltd. Similar Italian moves to set up a tuna industry on the East Coast in 1968 seem to have failed.

Italian Requirements

E.F.I.M. requires at least 10,000 tons of tuna a year and has been buying from Japan. The Japanese, however, cannot continue to supply this amount.

Australian Survey

The Fremantle Society, interested in a Western Australia tuna fishery, made a North-West survey several months ago. The main grounds appeared to be between North-West Cape and Port Hedland, out to the edge of the Continental Shelf, and from Broome to Cape Leveque, out for about 60 miles. ('Fish Trades Review,' Dec. 1969.)

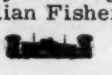
* * *

TRY NEW METHOD FOR CATCHING SPINY LOBSTERS

The builders of an experimental 25-ft. submarine are testing a new method of catching tropical spiny lobsters. An electric current is passed through the sand where the lobsters settle, shocking them and making them jump out. A device then sucks them into the submarine.

Dominant Species

Tropical lobster, 'Panulurus polyphagus,' is found in muddy sea bottoms in northern Western Australia. This species is dominant on the west coast of India. There, it is caught in hoop nets, or by trawling at 35 fathoms or below. ('Australian Fisheries')



LATIN AMERICA

PERU

FISHING INDUSTRY DEVELOPMENTS

The 1969/70 anchovy fishing season started very poorly. There was a nationwide fishermen's strike in Nov. 1969. Warm water drove fish below normal depths, and the 'peladilla,' or immature anchoveta, appeared early. However, near-record catches in Dec. 1969 and good fishing in first weeks of Jan. 1970 revived industry optimism.

Production, Exports, Prices

About 1,840,000 metric tons of anchovy were caught in December; fish-meal production was about 330,000 tons. End-of-year stocks were about 300,000 tons, but heavy exports in first weeks of 1970 reduced stocks on hand to an even-lower level. Future prices for fish meal dropped from close to US$200/metric ton to $140-150, still a relatively high price.

'Peladilla'

To cope with 'peladilla' (small fish), the government chose to close fishing ports selectively rather than declare a general closed fishing season or 'veda' as in the past. Because fishing was so poor early in the season, the government chose this half-measure to meet industry needs and still protect the anchovy resource. However, industry sources reported that up to 80% of the December catch on some vessels was 'peladilla.' Callao, Ilo, Pisco, and Chimbote were closed on and off for short periods.

Tax On Industrial Use

On Jan. 1, 1970, taxes were increased on fish and whale meal, and crude and semirefined fish-oil exports. Industry did not object too loudly. The taxes include a 'Fishing Canon' of 1.5% of f.o.b. value of all exported fish and whale meal and oil in payment for industrial use of national resources. There is a similar 'canon' on exploitation of mineral resources.

Advance Payments on Income Tax

Exporters will pay customs an advance on income taxes at rate of: 5% of f.o.b. value on fish-meal exports; 2.5% of f.o.b. value on whale-meal exports; 6% of f.o.b. value on crude fish oil; 2% of f.o.b. value on semirefined fish oil. These charges will have the effect of a tax only when a firm's income taxes are less than advance payments.

New Vessels

Despite poor fishing, industry sources reported that Peruvian shipyards produced 75 large, modern fishing vessels in 1969 (many up to 350 tons). An even larger production is expected in 1970. This activity contrasts sharply with lack of active expansion of fish-meal plants or other sectors of economy. It may be that the need to renovate the fishing fleet has become so acute that industry can no longer delay.

New Minister Discusses Policies

At a press conference in Lima, Feb. 5, the new Fisheries Minister, General Javier Tantalean Vanino, discussed policies to be followed by the new Ministry. It had begun operations on Feb. 2.

He said fishing industry is pillar of Peru's economy. He recommended that fish-meal plants use their stickwater, that obsolete 100-ton vessels be replaced by 300-ton vessels, and that Peru develop an edible-fish industry. He would welcome foreign capital and technology to effect these changes. And he believes Peru should "occupy all 200 miles of littoral seas to insure sovereignty."

The Minister made two other significant comments: (1) No new fishery law is being planned; any necessary changes in fishery management will be made under existing procedures. (2) No fishing companies will be nationalized, but the government plans to control fish-meal marketing 'from beginning to end.'

He announced a closed fishing season from Feb. 11 to March 17. (U.S. Embassy, Lima, Jan. 20 and Feb. 6.)

EL SALVADOR

JAPANESE WILL SURVEY EL SALVADOR FISHERIES

Taito Seiko, a net-manufacturing subsidiary of Taiyo Gyogyo, Japan, will conduct a 1-year feasibility study of El Salvador's fisheries.

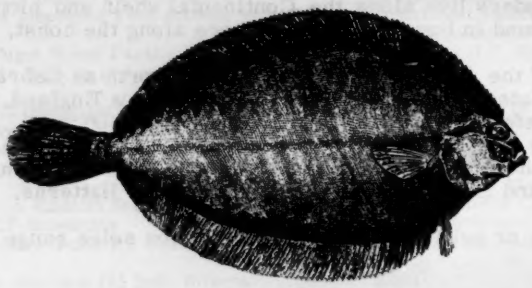
Five domestic firms, interested in a joint venture and believing FAO data inadequate, had asked Taito Seiko to carry out the survey. The 5 want information on the abundance and kinds of fish available. If survey results are favorable, Taito Seiko may join the 5.

S. Korean Survey

S. Korea sent experts to El Salvador for a similar survey in March-April 1969. They made recommendations, but so far no action has been taken. (Reg. Fish. Att., U.S. Emb., Tokyo, Jan. 30, 1970.)

Workers at the Puerto El Triunfo plant in El Salvador unload a catch of fresh shrimp. (Photo: FAO, Y. Hagata)

FOOD FISH FACTS



Gray Sole
(Glyptocephalus cynoglossus)

Soles are delightful-to-eat members of one of the most clearly defined and distinctive orders of fish (Heterosomata). This order also includes other flatfish such as halibut, turbot, flukes, and flounders; and all of them share a very unusual characteristic. All flatfish begin life swimming about in a normal manner but very soon their behavior patterns change. Their skulls begin to twist and one eye begins to move toward the other side. At the same time, the fish begins to tilt. Very soon both eyes peer from the same side and the fish swims with the eyeless side down. Some twist to the left and some to the right; however, all share the same flying saucer appearance. This change involves a complex modification of the head bones as well as of the nervous and muscle tissues. The underside of these fish is usually white, blending with the light filtering down through the water. The top side is pigmented, resembling the bottom on which the flatfish lives. An interesting fact is that the eyes of these fish can be raised slightly and moved independently, thus increasing vision. In size and other characteristics, flatfish vary greatly.

DESCRIPTION

Atlantic coast soles include two main species. The gray sole (Glyptocephalus cynoglossus) is also called witch flounder. This sole, which grows up to 25 inches in length, is noted for its fine flavor and is rapidly growing in commercial importance. Approximately 4.9 million pounds of gray sole were caught in 1968.

The lemon sole (Pseudopleuronectes americanus) is called a winter flounder or blackback when it weights less than $3\frac{1}{2}$ pounds. Its usual length when caught inshore is around 18 inches. These two Atlantic soles share characteristic small mouths, straight lateral lines on bodies, and eyes on the right sides.

Pacific coast soles include the two following species: The petrale sole (Eopsetta jordani) is also known as brill sole. It averages about 17 inches in length and around $2\frac{1}{2}$ pounds round weight. It has a wide body, small scales, large mouth, slightly curved lateral line, and is olive-brown in color.

The English sole (Parophrys vetulus) is also known as the lemon sole but as an entirely different species than the Atlantic lemon sole. It is noted for its fine flavor. Smaller than the petrale, the English sole averages about 15 inches in length and slightly over $\frac{3}{4}$ pound in weight. It is distinguished by a small mouth, a slender shape, and a pointed head.

Other soles of the Pacific include the rex, Dover, and rock.

(Continued following page.)

HABITAT

Most sole and flounders live along the Continental shelf and slope. Some come into shoal waters and are found in bays and close inshore along the coast.

The lemon soles of the Atlantic range from as far north as Labrador and as far south as Georgia with the greatest abundance off the coast of New England. They live from 1 to 20 fathoms deep and prefer soft muddy to moderately hard bottoms.

The gray soles of the Atlantic live in moderately deep water from the Gulf of St. Lawrence, the southern Grand Banks, and as far south as Cape Hatteras.

The Pacific petrale or brill and the English or lemon soles range from Southern California to Alaska.

SOLE FISHING

Sole are considered fine sport fish and are taken by hook and line, spears, nets, and seines. The otter trawl is used most extensively in commercial fishing.

CONSERVATION

The life history, migrations, and habits of many flatfish are not well understood by fishery scientists. To maintain fishery resources at a high level of production for both the fishing industry and the consumer, cooperative State-Federal research and development efforts are needed. In recognition of these needs Congress passed the Commercial Fisheries Research and Development Act of 1964. This act authorizes the Secretary of the Interior to enter into cost-sharing cooperative agreement with the States and other non-Federal interests. This program is administered by the Bureau of Commercial Fisheries. Many projects, designed to better understand fish and their environments, have since been undertaken. Some of these projects, particularly along the Pacific coast, have been specifically designed to learn more about our flatfish resources.

All fishery research, whether State or Federal, has a basic goal to ensure the wise use of renewable resource.

USES OF SOLE

Sole are fine eating fish. The flesh is firm, white, and delicate in flavor. Most sole are filleted and may be purchased either fresh or frozen. Fillets vary in weight from 2 to 4 ounces and occasionally up to 8 ounces. Some sole are dressed and sold whole for stuffing. Sole adapts readily to a wide variety of preparation methods. (Source: National Marketing Services Office, BCF, U.S. Department of the Interior, 100 East Ohio Street, Rm. 526, Chicago, Illinois 60611.

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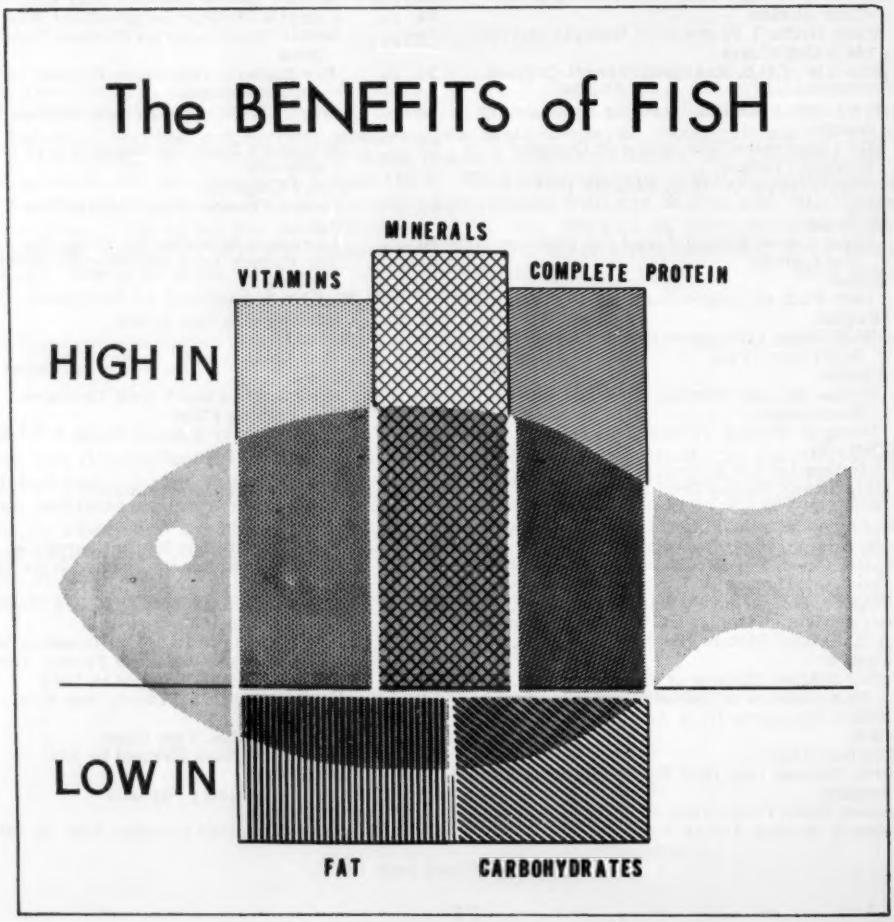

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UNITED STATES DEPARTMENT OF THE INTERIOR

Walter J. Hickel, *Secretary*

Leslie L. Glasgow, *Assistant Secretary*
for Fish and Wildlife, Parks, and Marine Resources

Charles H. Meacham, *Commissioner*, U.S. FISH AND WILDLIFE SERVICE

Philip M. Roedel, *Director*, BUREAU OF COMMERCIAL FISHERIES

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

BACK COVER: Mackerel.
(Photo: G. M. Mattson)